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SEASIDE WALKS

OF A NATURALIST

REV. W. HOUGHTON.





1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100.

1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100.



SEA-SIDE WALKS OF A NATURALIST

WITH

HIS CHILDREN.



BY

REV. W. HOUGHTON, M.A., F.L.S.,

AUTHOR OF "COUNTRY WALKS OF A NATURALIST," ETC.

*ILLUSTRATED WITH EIGHT COLOURED PLATES AND
NUMEROUS WOOD ENGRAVINGS.*

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PREFACE.

I SEND forth this little book as a companion volume to my "Country Walks," hoping that it may induce some of the numerous young people visiting the sea-side, to take an interest in the study of Marine Natural History.

I have once more to thank Mr. Gould for his kind permission to copy some of his drawings in his work on the Birds of Great Britain.

•

TO MY WIFE,

THE FOND MOTHER OF MY CHILDREN,

FROM WHOM, IN ALL MY LITERARY WORK,

I HAVE RECEIVED MUCH VALUABLE HELP,

I Dedicate this little Volume.

PRESTON RECTORY,
June 6th, 1870.

CONTENTS.

| | PAGE |
|---|------|
| WALK I. | 1 |
| On the Shore—Refuse left by the Tide—Shark's Egg—Sea-fir Coralline—Knotted thread Coralline—Marine Polyzoa—Natica Monilifera—Eggs of Natica Monilifera—Sea Mouse. | |
| WALK II. | 14 |
| On the Shore—Various Shells—Pholas Dactylus, Boring action of—Sea-gulls—Uncle John's Gull "Jim"—Sand-launces—Pectinaria Belgica—Shrimp-woman—Lesser Weever, or Sting fish—Dead-men's Fingers. | |
| WALK III. | 26 |
| Train to Colwyn—Walk from Colwyn along the Shore—Sea-weed, Ammophila—Yellow horned Poppy—Wild Geraniums—Sea-Anemones—Sea-weeds—Ptilota Plumosa—Sea Lettuce—Corallina Officinalis—Purple Laver—Cornish Sucker—Snake-locked Anemone—Account of Rhos-Fynach Farm and Weir. | |
| WALK III.—(Continued) | 38 |
| Mr. Parry Evans's Fishery Weir—The celebrated Salmon-catching Dog "Jack"—Fish left in the Pool by the retiring Tide—Salmon—Mackerel—White-bait—Garfish—Sapphirine Gurnard—Fine fun at the Weir—Admirable behaviour of the dog "Jack." | |
| WALK IV. | 48 |
| On the Shore again—Sea-holly—Sea Spurge—Poisonous nature of the Spurge family—Cormorants—Tern, or Sea Swallow—Crabs, Metamorphosis of—Crab-pots—Sea-weeds—Rhodymenia, etc.—Zooephytes, Plumularia, Campanularia, etc. | |

| | PAGE |
|--|------|
| WALK V. | 61 |
| Train to the Weir—Search amongst the Stones and Rocks—
Common Whelk—Egg Clusters—Dog-Whelk and Egg cases—
Pipe-fish—Sea-Horses—Delesseria Sanguinea—Phyllophora
Rubens—The Shanny—Naked-gilled Molluscs, Eolis Coronata—
The Sea Long-Worm. | |
| WALK VI. | 73 |
| Train to Llandudno—Walk round the Great Ormeshead—
Cotoneaster—Rock-Roses—Catch-flies—Spiked Speedwell—
Puffin Island—Trawlers—Trawl Net and Trawling described—
Puffins—More Wild Flowers. | |
| WALK VII. | 83 |
| In the town of Pensarn—Buying a Sponge—Foraminifera—
On the Shore again—Lugworms—Lesser Black-backed Gull
—Skua Gulls—Terebella. | |
| WALK VIII. | 94 |
| On the Shore after a Storm—Sea-Cucumbers, curiously
formed spicules of—Cormorants again—Fishing with tame
Cormorants—Serpula—Hermit Crabs. | |
| WALK IX. | 105 |
| Train to Colwyn—Pwllcrochan Hotel—On the Shore—
Shell-Drakes—Prawns—Prawn-Trap—Teredo navalis or Ship
worm—Sea Acorn Shells—Barnacles—Skates. | |
| WALK X. | 116 |
| In Pensarn—Humming-Bird Hawk-Moth—On the Shore—
Sand-Hoppers—Star-fish—Common Five Fingers, destructive
to Oyster—Rail once caught by his bill by an Oyster—Oyster
Catcher—Oysters, old and young—Top Shell. | |
| WALK XI. | 126 |
| On the Shore during a Storm—Porpoises—Ascidians—Cuttle-
Fish—Solenensis or Razor-shell—Mode of Catching—Molluscs—
Whelk—Tellina—Donax—Old Oyster Shell—Storm Petrel—
Sponges. | |
| WALK XII. | 140 |
| On the Shore, Weather Calm—Medusæ or Jelly-fish,
development of—Cydippe pomiformis—Sea Anemones—Skate
—Leech—Jaws of Angler Fish—Habits of described—Limpets—
Crab covered with Oysters—Periwinkles—Lines from Tennyson
—Mussels, Byssus of—Sea-Hare—Conclusion. | |

SEA-SIDE WALKS OF A NATURALIST

WITH

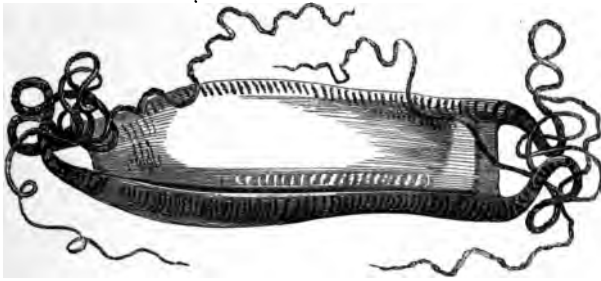
HIS CHILDREN.

WALK I.

THERE we are at the sea-side ! How I do rejoice in a sea-side holiday ! It is the month of July, and we have left the hot lanes and dusty roads, and parched fields of the country to breathe the fresh invigorating sea breezes. How many curious forms of animals and plants we shall meet with in our daily rambles on the shore ! how delightful it will be to take Willy and Jack for a bathe every now and then, as the tide suits ! We are at the little village of Pensarn, close to the town of Abergele, on the Chester and Holyhead Railway ; we can easily visit Rhyl, Conway, or Llandudno, stay at either place for a few hours, and home again at night. “ Indeed,” said Willy, “ it will be very pleasant. I shall look out for the sea anemones, so beautifully drawn in some of your books at home, and for sea-side shells, and worms and other

creatures ; and May will collect sea-weeds to dry and take home for examination ; and Jacko is sure to find something curious ; and little Arthur and Robin can make sand-tarts on the shore." Yes, we are quite certain to find lots of things to interest us, and from which we may all gain delight and instruction, so we will be off on the sands at once. I will take my fishing-basket and a few wide-mouthed bottles, and my vasculum for plants ; and you, May and Jack, must each have a strong muslin net for catching fish, and small crustacea in the pools left by the tide. On the shore then we soon find ourselves, the tide is already half way out, and grown-up people and children are strolling on the shore ; some of the latter digging in the sand or throwing stones into the retiring waves. Now let us look out for what the tide has left at high-water level. You observe how far the water has reached and that it has left various refuse behind it—bits of sea-weed, stick and rotten wood, cinders which have been cast overboard from steam-boats, entangled masses of stringy stuff, and I can't tell you what besides. "Aha !" said Jack, "here is a very curious thing entangled in a heap of what I suppose must be sea-weed, what can it be, papa ? it is not alive, is it ?" Let me look ; what you call sea-weed, and what, no doubt, most sea-side visitors look upon as mere dirty rubbish, contains multitudes of beautiful and instructive objects. But let us first see what has attracted Jacko's attention. Ah ! I know it well ; similar forms are very common on every coast ; the leathery oblong thing you hold in your hand is the

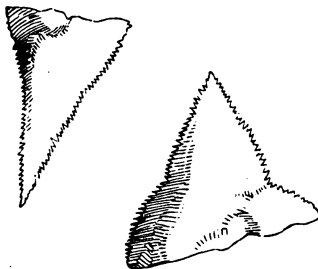
empty case of a shark's egg. "A shark's egg!" exclaimed May; "well, I did not suppose that any creature's eggs were of such curious form." Most sharks do not lay these horny eggs but produce their young alive; some, however, lay these strange-looking eggs, in each of which a young one has been developed. This one which Jack holds in his hands is about three inches long, with two handles at each end, which extend



EGG OF SHARK.

themselves into very long tendrils. You see how tough and leathery it is; the long tendrils coil themselves round sea-weed or coral stalks, and so anchor the egg securely against the tossing of the waves, until the enclosed young one is ready to be hatched. "Papa," said Willy, "I am sure I have seen pictures of these things in some of your books, and I think the people of the coasts sometimes call them *mermaid's purses*." You are quite right, my boy; and somewhat similar things, which are the horny eggs of some of the skate or ray fishes, are often called skate barrows, from a sort of resemblance to a barrow. "But, papa!" said May, "is

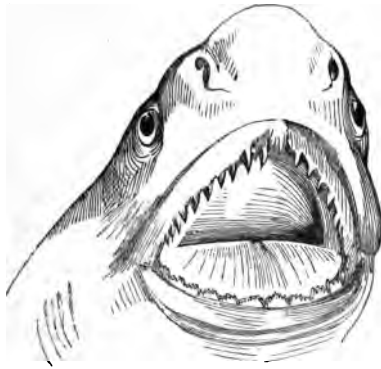
this the egg-covering of that fierce shark we read of that so often kills men when they fall overboard?" No it is not. That which you are looking at is the egg-covering of the lesser spotted dog-fish. "I thought you said it was a shark's egg," said Jacko. Dog-fish belong to the shark family, and in general form and structure all the members of that family resemble each other. The names dog-fish, smooth hound, rough hound, etc., which distinguish different species are all meant to show the rapacious habits of these fish; they may also be applied to them from their habit of hunting their prey in companies or packs.



TEETH OF WHITE SHARK.

The chief difference between sharks and other fish with which you are all familiar, consists in the former having five slits on each side of the neck; these are the branchial openings, or gills. In most other fish, the gills are protected by an operculum, or gill-cover. At each end of this horny egg membrane is a long slit or fissure; these slits allow for the

admission of sea-water, without which the egg could not be developed into a young fish; from the one near the head the young one escapes. When the young are hatched, they have each a round membrane containing the yelk attached to their under surfaces as in other fishes, by means of which nourishment is conveyed into their bodies, till the mouths of the young fish become capable of seizing their prey. "Are not sharks' teeth very formidable things," asked Willy, "and capable of inflicting severe in-




HEAD AND JAWS OF SHARK.

juries?" Yes, the teeth of all the shark family are very sharp and pointed, though they differ considerably in form according to the species; the jaws are furnished with several rows of teeth. You will laugh when I tell you that some years ago sharks' teeth, under the name of serpents' teeth, used to be set in

silver, and given to children cutting their teeth, it being supposed that they had some peculiar charming property.

May wished to know whether I had ever seen a Hammer-headed Shark, and whether the fierce shark, the terror to sailors in warm seas, ever approached our coasts? and Jack asked me what was the largest shark I had ever seen at any sea-side place? I have never seen a specimen of the strange Hammer-headed Shark, and believe it does not often visit our shores. I only know of it from drawings and descriptions; it is said to be a fierce creature and to attack bathers, and to measure sometimes seven or eight feet in length. I believe it is not uncommon in the Mediterranean Sea. We may be thankful that the White Shark, that dread of bathers in the seas around the West Indies and other tropical countries, is not found near our coasts. One or two instances are recorded of specimens having been taken, but there seems to be considerable doubt about the matter. The largest shark I ever saw was taken by some fishermen at Tenby many years ago. It was a specimen of the Blue Shark, and measured about six feet in length.

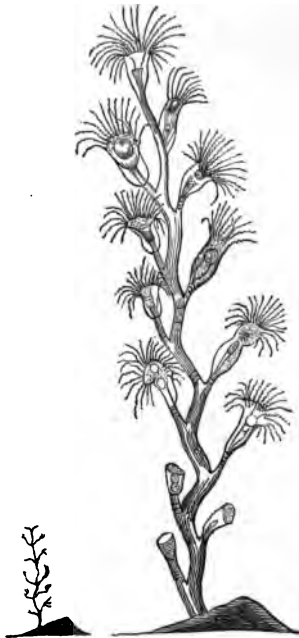
“But what,” asked May, “is this entangled mass?” You said it was not sea-weed. Well, look through this hand-magnifier, and you will see the object more clearly. I break a bit of the thread-like stuff, and now you see it is branched like a miniature tree; you notice that each branch buds out on each side a number of little cups; they are empty now, but were once



occupied by a number of little jelly-like creatures, called polyps. Here is a larger piece; see how beautiful it is; it is called the sea-fir coralline (*Sertularia abietina*). Let us examine the entangled mass again. Here is a very fine specimen of the squirrel's-tail coralline (*S. argentea*), that has been washed off the shell of some oyster or other mollusc. It is very graceful when floated out in water, and bears some resemblance to the tail of the squirrel. But what, asked Willy, are the little creatures like, that once inhabited these cells; are they at all like the fresh-water polyp or hydra we used to find in our country walks? * Yes, they bear a strong family likeness; but the fresh-water hydra, you remember, is naked, and can move from place to place. But the animals that inhabit these horny branches live in colonies, and cannot, at least in their adult stage, go from place to place. Ah! what have I here? Why, the knotted-thread coralline (*Laomedea geniculata*), and actually I do think there are some live polyps within the cells. I will put a bit in my bottle with clear salt-water; there, as I thought, you see them pushing out their little heads. You see that this coralline is attached to a piece of sea-weed (*Laminaria*). Mr. Couch tells us he has found some of the finest specimens growing on the back and tail-fins of a dog-fish. The cells of this species are bell-shaped; the polyps are like the fresh-water hydra in form; you observe their numerous tentacles expanded outside of each horny cell. "But what kind of animals do you call those which

* "Country Walks," p. 64.

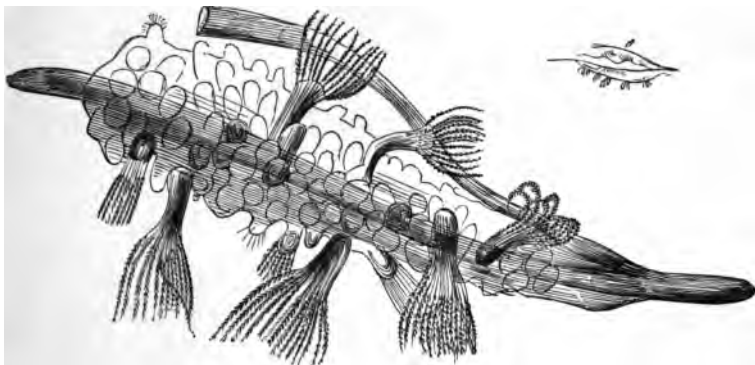
dwel in these little homes?" asked Willy. They belong to the class called *Hydrozoa*, a word meaning water-animals, very indefinite certainly, but when naturalists use the term, they mean by it small jelly-like animals, with a body that can contract, a mouth



with numerous tentacles around it which bring it food, and a stomach. This is enough for you to remember at present. The hydrozoa contain many families, and a great number of species. They are

very interesting microscopic objects ; so we will collect a lot of this stuff, which people would, perhaps, call "rubbish," and try to name the species, by the help of the microscope, when we get home.

Here is another curious thing ; it is merely a dirty white substance, like a bit of gristle, surrounding a branch of coralline for the length of about half an inch. By the aid of my lens I notice it is covered



with small blunt conical excrescences, but not a symptom of either cells or polyps. If put in water for a time and examined under the microscope, we should see coming out of the various parts of the mass a bunch of long tentacles. At first sight we should suppose that this encrusting animated mass was closely related to the *Sertularia* and *Laomedea* we found just now ; but we should be wrong : you would find that the animals of this colony are much more highly deve-

loped and of more complex structure than the hydrozoa. The name of this little specimen is *Cycloum papillosum*; it is one of the class *Polyzoa*, fresh-water species of which, you may remember, we found last summer in our country walks.*

Holloa! Master Jacko, what have you got now? "Oh, papa, I really don't know," said Jack; "it is a broad band in the shape of a horse-shoe, and



NATICA MONILIFERA.

seems to be made of jelly and sand; I found it lying loosely on the shore." "Let me look," said May; "if you hold it up to the light, you see it is nearly transparent, and the surface is marked with numerous angular spaces. What is it, papa?" It is an egg-cluster laid by a mollusc, with an elegantly-marked shell. You may often pick up these shells on the shore; they are very common. Keep the curved egg-cluster in your hand, and I have no doubt I can soon find you a specimen. "But what is it like?" said Willy; "univalve or a bivalve?" It is a univalve, pretty polished, of light brown colour, but marked

* "Country Walks," p. 97.

with dark stripes and spots. "Oh!" said Jacko, "this is the fellow then? it exactly answers your description." Quite right, my boy. This is the shell, the animal belonging to which lays these curious egg-bands. Its name is *Natica monilifera*. There is no animal inside it now; but if we were to dig in the sand I dare say we should find some shells with animals inside; they are said to be voracious, and to drill holes in the shells of other molluscs in order to



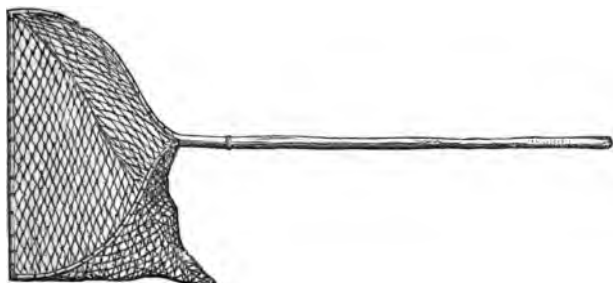
SEA-MOUSE.

get at the dainty meat inside. Let us take this strap-shaped band of eggs to our lodgings, and see whether we can succeed in hatching some little naticas.


"Oh! papa," cried May, "I do think here is a sea-mouse lying on the shore. Bah! I don't much like to touch it." You are quite right, May; the creature you see on the sand is the sea-mouse. I need not tell you it is no more a mouse than you are; it is an animal much lower in the scale of creation than an active, warm-blooded, four-legged mouse; it is, in fact, a worm. "I do not think, papa," said Jack, "that it looks much like a worm; how different it is from the worm we use in fishing." No doubt, Jack, it is very different in outward form; but in its

inward structure—and you must wait till you are a little older, when you will be able, I hope, to examine for yourself—it is clearly a worm. Let us look at it. It has an oval body, three or four inches long, dullish grey in colour, with a quantity of fine silky hairs down the back; on the sides you see several rows of hard, dark bristles, and amongst these, long silky hairs, perhaps an inch long; see now, I turn the animal to the light at different angles, how brilliant and metallic they are! Orange and green tints in abundance. Under these silky hairs on the back I see several pairs of scaly plates. I will turn the creature over; see how the under surface is divided into a number of transverse rings; I can count about forty of them. Now remember this division into rings. Each ring is produced at the margin into a short fleshy lobe, armed with a threefold row of stiff hairs; by means of these bodies the sea-mouse can swim or crawl; the stiff hairs are curious weapons with barbed teeth, and can inflict a severe wound on soft bodies; by an admirable contrivance they can be withdrawn within their respective sheaths. The specimen we are looking at shows brilliant colours; but, poor thing, it has been knocked about by the waves, and does not appear to the best advantage. The best specimens are obtained by dredging. I remember some years ago, when at Guernsey, getting splendid fellows in the dredge. The sea-mouse preys upon other animals, and does not object to make an occasional meal on one of its own species. Mr. Rymer Jones once kept two sea-mice in an aquarium; after living peaceably

together two or three days, the former was found attempting to devour his companion, which was a good deal smaller. One half was already swallowed into its strong and capacious proboscis, while the victim struggled desperately to be free. However, after retaining the prey for some time, the assailant was obliged to disgorge it, but the animal's back was broken. Next morning only half of the poor fellow remained, the other portion having been devoured; the conqueror now darted out its proboscis repeatedly, in order to finish its meal on the rest, as it lay in a corner. Well, we have not found many objects, so far as number goes, but all are interesting, and will unfold tales of delight to those who care to examine their structure carefully. There goes an old shrimp-woman: we have not time to go and chat with her; but the old lady's net is quite a treasury for a naturalist. We will talk with her and examine the contents of her net on some other occasion. Let us return to our lodgings and examine our captures.



WALK II.

HE tide will be a low one to-day, so we will stroll along the beach for a couple of hours before low water; there are several people on the sands, but few that take any interest in the curious things to be found there. Now, May, look about for shells, put them in your basket, and let me see if I can name them. Well, what have you got? Here is the very common but very beautiful and very delicate *Tellina tenuis*; here is the razor-shell, *mactra*, *pholas*, *mya truncata*, *donax trunculus*, cockle, and mussel shells.

The tellinæ you see are very common; you can hardly walk a yard without finding some; they are beautifully polished, and often painted with glowing hues. "But, papa," said Jack, "the shells are always empty, and we generally find them single; sometimes, however, we find the two valves joined together, forming such a pretty little box; where do the animals that form them live?" These molluscs live in sand or mud, and you may get a few by digging; the animal is of a delicate white colour, and has two long nearly equal siphons, and a pretty fringed mantle; but you must put the creature in water before you can see them. "But what is the

use of these siphons?" asked Willy. The siphons are merely tubular prolongations of the animal's mantle; the one brings currents of water to enable the animal to breathe, the other expels the water after it has passed through its gills or lungs. Here is the brittle paper-shell, *Pholas dactylus*, of delicate texture and of a pure white hue; the outer surface is rough with transverse scaly ridges. The word *pholas* is derived from a Greek word signifying "to be hidden," in allusion to the custom of the animals to live in holes which they make for themselves in peat, mud, clay, wood, and stone. "But, papa," said Jack, "how can an animal with so brittle a shell—see how easily it breaks in my hand—bore for itself a hole in hard stone?" You have asked a puzzling question, and one on which, I believe, there is still much difference of opinion; but, first of all, let me tell you what the animal is like. He is fat and club-shaped, with a large flat foot, and a pair of siphons united externally into one. I have already said these siphons are respiratory organs; the one admits the water, the other expels it. These currents may be seen by placing the animal, or any other mollusc possessing the respiratory siphons, in a vessel of water with minute particles of matter; by the one entrance you will see the water to be drawn in, by the other expelled. "But you have not told us how so brittle a shell can pierce the rocks in which you say the *pholas* often lives," Willy remarked. You may suppose that various explanations have been given, and I will first enumerate them. Some say that the boring

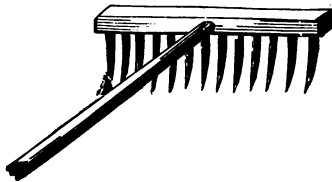
molluscs perforate by means of the rotation of the valves of their shells, which serve as augers ; others say that the holes are made by rasping, caused by silicious particles studding the surface of certain parts of the animals ; others, that currents of water, set in action by the motions of vibratile cilia, are the agents. Some affirm that the animal secretes an acid which dissolves the substance into which it bores ; others say that the boring is effected by the combined action of some acid, and the rasping of the valves. "Who shall decide when doctors disagree?" My own opinion is that the boring is effected by the simple constant action of the mollusc's foot. "But," said May, "it still seems curious that so soft a thing as a sea-snail's foot should wear a hole in a solid hard wall." Very good ; but you must remember that time works wonders. Look at these hollows on this bit of rock ; those impressions, I know, were made by limpets, which, by moving their soft bodies constantly on one spot, wear away the substance on which they have taken their stand. "Well, papa," said Jacko, "that reminds me of what I have often seen under the canal bridges at Preston. You know there are some iron pillars placed against the corners of the stone bridges, and you can see several grooves made in these pillars by the action of the rope against them, as it is drawn tightly by the horse that is towing the barge. I suppose the soft rope has made these grooves in the hard iron." You are quite right, Jack, and your illustration is a capital one. As, in time, a soft rope constantly rubbing against hard iron wears

it away, so, I believe, the foot of a *pholas*, by constant rubbing, in time wears away a hole in the solid rock.

Oh, do look how prettily the sea-gulls are skimming over the surface of the water; now ascending with extended wings, now darting down and nearly touching the water; it seems no effort whatever to them to raise themselves quite suddenly aloft. "Papa," said May, "I think you said, some time ago, that it was not lawful to shoot gulls and other sea-birds during the breeding season; the poor birds must enjoy their holiday." Yes, I am very glad the sea-fowl are protected by law; but I wish the insect-feeding birds of our country lanes and fields were also protected. It was a good thing for our Government to stop the wholesale destruction of sea-birds; they should crown the whole by passing a law to protect our land-birds, a much more important consideration, in an economic point of view. I love to hear the wild cry of the gulls, and to watch their airy flights. They are voracious birds, and can swallow very large food. I remember a tame gull Uncle John had at Brockton some years ago; he used to call it "Jim," and, long after the bird's death, a small strip of water in which it used to swim retained the name of "Jim's river." After dinner we used to put our heads out of the window, and call "Jim;" the bird soon responded, if he was hungry, by making a peculiar noise. Presently "Jim" made his appearance in front of the window, and we used to throw out pieces of bone with meat on. "Jim" could swallow enormous bones. Sometimes we caught a rat in a steel trap, and "Jim" was

very fond of rats; he would pull the rat about for a time, and bruise it with well-directed blows of his strong bill; and when he thought it was sufficiently tender, he would raise his head aloft, and, with four or five consecutive efforts, contrive to swallow the rat, tail and all. But Master "Jim" was fond of daintier food than rats; the young ducks and chickens used to disappear down his capacious throat, and strict watch had to be kept upon him. I forget what became of "Jim;" he died long before his master, but whether by a violent or natural death, I do not now remember.

Oh! just look at this fish's head popping above the sand near low-water mark. How curious! "Why,



RAKE FOR PROCURING SAND-LAUNCES.

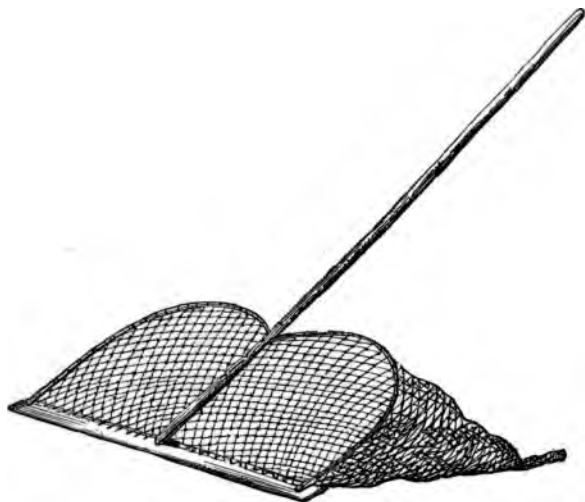
if we look about us," said Willy, "we can see any quantity; some near the water's edge are quite lively, but those higher up and further removed from the sea are dead. What are they?" They are little fish called sand-launces, *Ammodytes*, and very pretty little fish they are. There are, I believe, three species of sand-launce, and all inhabit the water near the sandy coasts. Here we meet with the larger and lesser sand-launce. See how the whole shore is spread

with them. Hundreds are quite dead; the tide is unusually low, and the fish have been waiting for the return of the sea-water. The hot sun, I suppose, has destroyed them; at any rate, there they are quite dead. Those nearer the water are pretty lively; the sea-water has only just left them. Willy wanted to know whether they were ever eaten. They are valued as food by some people. I should think, to judge from their appearance, they are very good eating; but I have never had any cooked. These fish can move quickly enough in the wet sand, but do not seem able to bear it when it is dried by the hot sun. The sand-launces are a favourite bait with fishermen, who use them for catching mackerel.

"See, papa," said May, "what is this pretty little tube of fine sand; it is nearly an inch long, and open at both ends, conical in form." It is the sand-house of a very interesting little worm, called *Pectinaria belgica*. I will pull him out of his case. There, you see there are some shining bristles on its head, arranged in a comb-like form; whence the creature's name;—*pecten*, in Latin meaning "a comb." Let us look for some more of them. Here they are in abundance; the tubes always stand upright, with the tail end slightly imbedded in the sand; the head has many tentacles besides the comb of bristles.

"But, papa," said Jack, "how does the little worm make this delicate tube of sand as thin as paper?" It selects the grains of sand by means of its tentacles, which secrete a sticky fluid; the grains adhere to them and the creature applies them to the rim of

its tube. "Oh!" exclaimed May, "in this respect the little pectinaria resembles the fresh-water *Melicerta* we find abundantly on the weeds in the canal at home." It does, and both build upwards, for the tube is only increased by addition to this end, the tail portion undergoing no alteration. The worm exactly fits its case, the thickness of which does not exceed a single grain. The usual length of these tubes is about



SHRIMP'S NET.

an inch; but they are occasionally found as long as two inches and a half; Sir John Dalyell mentions his having seen a tube five inches long, the worm nearly corresponding in size. It is probable this was a different species. Ah! there is the old shrimpwoman



1. LESSER SAND LAUNGE. 2. VIPER WEAVER. 3. HIPPOCAMPUS. 4. GARFISH.

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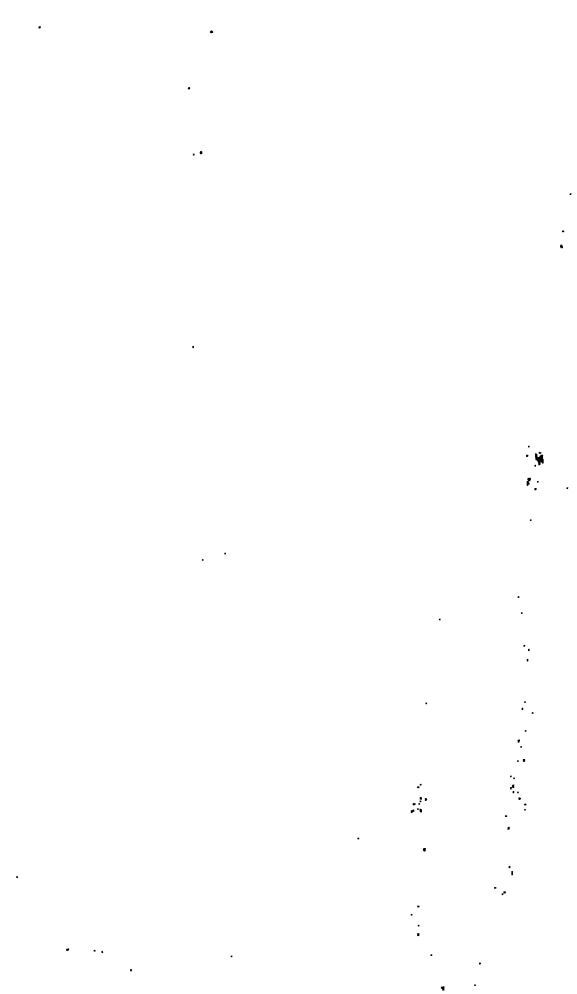
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about two hundred yards ahead of us ; she is pushing her shrimp net before her, let us hasten to her before she throws her "rubbish" away. Well, old lady, are you having good sport? Have you caught many shrimps? bring your net out, please, and let us look. "I have caught a goodish few," said the old woman, "will you be so good as to buy six penn'oth of shrimps; they be very fine ones." Oh yes, we will buy some, but let us look what you have got in your net besides shrimps. "Lor, young maister, dunna ye touch that nasty baste," exclaimed the old lady, as she thought Willy was about to seize on a small fish he espied in the net; "it'll sting ye, lad, till ye cry out wi' pain." Well, let us get the fish out of the net and place it on the sand that we may get a good view of it. Ah! it is the lesser weever (*Trachinus vipera*), a very common fish on all our shores; this specimen is about four inches long. "But how does it sting?" asked Jack. Do you notice that black fin on the back with its four or five sharp prickles; those are the fish's weapons, and there is no doubt a prick from one of them occasions a good deal of pain with much swelling. Do you observe also the up-turned position of the fish's mouth? Its habit is to bury itself in the sand with its head exposed, the shape of the mouth being admirably formed for snapping up any creature that may swim over it which it wishes to eat. The precision and skill with which the formidable spine of the neck is thus directed to an object of fear that shall touch it or approach too closely, are indeed sur-

prising; by a sudden and rapid impulse it will inflict a wound if even the touch is confined to the tail, and that too without any injury to itself; and formidable indeed is the effect produced by the puncture. It is certain that no exudation or discharge of a poisonous fluid proceeds from this projecting spine; but it is equally certain that the pain which instantly follows the puncture is severe; and there are instances where within a few minutes this pain has extended from the hand as high as the shoulder. On one occasion when a fisherman had laid hold of a weever which he had taken on a line, the sudden plunge of the piercing instrument instantly compelled him to drop his prize; and when ignorant of the danger, it was grasped successively by two other persons, so great was the agony felt by all of them, that they were compelled to leave their fishing and proceed to land in order to procure relief; which however was readily obtained by means of smart friction with the sand of the shore.* I must also ask you to notice two long formidable spines directed backwards and fixed to the gill cover; there is no doubt these would inflict similar pain. There is a larger species of weever, not uncommon on some parts of the British coasts, measuring a foot or more in length; this species prefers deep water; it is called the greater weever or sting-fish (*Trachinus draco*). The French eat it and say it is excellent, but the fishermen are compelled by a police regulation to cut off the spines before they

* Couch's "Fishes of the British Isles."

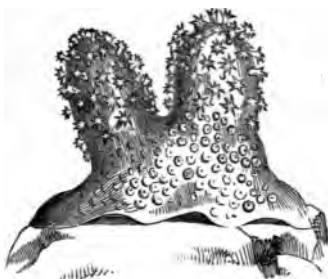
expose the fish for sale. Drayton in his "Polyolbion," has the following lines—

The Weever, which although his prickles venom be,
By Fisher's cut away, which buyers seldom see;
Yet for the fish he bears 'tis not accounted bad.

"Ah! what is this white thick mass in the old woman's net?" It is the zoophyte popularly termed "dead men's fingers." The net contains a number of young flat fish, small crabs, bits of sea-weed, some star-fish. We will pick some of these things out of the net, buy six pennyworth of shrimps from the woman, give her another sixpence for having kept her waiting, and say good morning to the old dame.

"What a curious name, 'Dead Men's Fingers,' to give to this zoophyte," said Jack. Yes it is; the specimen before us is a long, thick, oblong mass, but sometimes they are divided into several finger-like branches; it looks very uninteresting at present and very inanimate; but fill the largest glass jar with clear water, and let us look at it for a few minutes. There, do you see a number of little star-like bodies issuing from the fleshy mass? Look at it with this lens; each polyp has a clear cylindrical body with a beautiful flower-like mouth with eight rays; and now the whole substance is densely covered with these miniature animated flowers. If this spectacle will not delight a man, I should think nothing can. The *Alcyonium digitatum*, for that is the Latin name, is a good specimen of a compound polyp; like the hydra, each polyp of the alcyon, seizes its food by means of its eight ten-

tacles, the mouth being situated in the centre of the flower. I will suddenly move the glass jar; do you see every little creature has withdrawn itself into its cell? the flowers are all gone, and the alcyon



ALCYONIUM DIGITATUM.

is nothing but an apparently dead mass. Imbedded in this fleshy mass are a number of curious bodies called *spicula*. You cannot see them without the help of a good microscope; but if I were to cut a



SPICULES OF ALCYONIUM.

thin slice off this mass, lay it on a glass slip, with a little caustic potass to dissolve the fleshy portion, and put it under the microscope, I should see these calcareous spicules. The specimen before us is a small

one. Alcyonium loves deep water, from whence very large specimens may be obtained by dredging. They are generally attached to old oyster-shells. What a number of jelly-fish the retiring waters have left behind them! they look very uninteresting now, but it is a beautiful sight to see them on a calm summer's day to watch their movements in the water; we will pay attention to them on another occasion.

Now is it pleasant in the summer-eve,
When a broad shore retiring waters leave,
Awhile to wait upon the fine fair sand
When all is calm at sea, all still on land;
And there the ocean's produce to explore
As floating by, or rolling on the shore;
Those living jellies which the flesh inflame
Fierce as a nettle, and from that their name;
Some in huge masses, some that you may bring
In the small compass of a lady's ring;
Figured by Hand Divine—there's not a gem
Wrought by man's art to be compared to them.
Soft, brilliant, tender, through the wave they glow
And make the moonbeam brighter where they flow.



WALK III.



TO-DAY we will take the train to Colwyn, and from thence walk along the shore as far as the Fishing Weir at Rhos-fynach, to see Mr. Parry Evans and his celebrated dog "Jack" catching salmon. "Oh!" was the universal exclamation of delight, "that will be fun; and we will take our baskets and bottles in case of catching something we would like to bring home." So off we start by train from Pensarn. When we have passed over about two miles of the railroad we come to that memorable spot where the dreadful "Abergele accident" happened a few years ago. There is the cottage on the right hand side to which the engine-driver was taken; nothing now remains to mark the exact spot but a few stones lying on the side of the embankment. Well, we soon pass over; but we cannot do so without deep thought as we picture to ourselves that terrible calamity. On we go through a tunnel and skirt the coast, looking down upon the calm, clear, blue sea; the children chattering with delight at the prospect of seeing a dog catch live salmon; I myself wondering what different kinds of fish or

other marine creatures will be left in the Weir as the waters retire. Oh! for a life not *on* the ocean wave, but somewhere *near* it, a spot where I could study some of the endless forms of marine zoology, and inhale the invigorating sea breezes, come they as the gentle zephyr or the violent storm.

The sounds and seas each creek and bay
With fry innumerable swarm, and shoals
Of fish that with their fins and shining scales
Glide under the green waves, in scales that oft
Bank the mid sea; part single or with mate
Graze the sea-weed their pasture, and through groves
Of coral stray, or sporting with quick glance
Show to the sun their waved coats dropped with gold;
Or, in their pearly shells at ease, attend
Moist nutriment; or under rocks their food
In jointed armour watch; or smooth the seal
And bended dolphins play; part huge of bulk
Wallowing unwieldy, enormous in their gait,
Tempest the ocean.

“Colwyn, Colwyn,” uttered in loud, but peculiarly indistinct tones—railway porters always cry out the names of the stations in unintelligible language—aroused me from my reverie, and we were soon on our way along the shore towards Mr. Parry Evans’ Weir Fishery at Rhos-fynach. But we have more than a mile to walk, and lots of time; and how can a man walk along the shore without stopping every minute almost to look at something that has caught his eye. Here are some odd-looking plants, close to the railway embankment. They are growing in the driest kind of sand. Here we see the sea-weed (*Ammophila arun-*

dinacea), a very coarse but handsome grass, sometimes called mat-weed, from its matted, creeping roots; it is now in flower. As its roots are of use in preventing the inroad of the sea on the land, it is protected by an Act of Parliament. I do not think any kind of cattle will eat it; not even a half-starved New Brighton donkey. Here is the yellow-horned poppy, with its very long, horn-like pods; here, too, are some wild geraniums and stork-bills. Let us take a few back with us. "What are those little fish?" asked Willy, "that the tide has left in these small pools?" You ought to know them as we have seen them before; but try and catch two or three. Well! now you must know them? "Oh yes, they must be young sand-launces, about three inches long." "Papa," said May, "there are some large stones near the water; do you not think we might find some sea-anemones attached to these stones?" Off we all scamper, and Jack very soon tells us he has discovered what he thinks must be a sea-anemone. At once I recognize the animal as a specimen of the common smooth anemone (*Actinia mesembryanthemum*); we will wait by this large stone and examine the creature. It is fixed by its broad fleshy base to this bit of rock, its numerous tentacles spread out in the little pool the tide has left; the mouth is situated in the centre of the disc. I dare say we can tempt the creature to use it for our instruction. I will catch a small fish and offer it to the anemone. See the tentacles have caught hold of it, and are bringing it to its mouth; in about two minutes the fish is swallowed.

Here is another sea-anemone, a much finer specimen than the one Jack found. "Oh," said May, "it is a beautiful specimen; is it the same species?" It is generally considered to be a variety of the other one; it is called the "strawberry" anemone, from its resemblance to the fruit of that name. If I touch its



SEA-ANEMONES.

tentacles, it immediately closes itself up. These creatures have no eyes, yet are so susceptible of light, that they will often show they are aware of a passing cloud by shrinking. "Should an unlucky crab, though stronger far apparently and much more active than the zoophyte, touch the expanded arms, activity and strength avail it little; with slow, but

pertinacious and unflinching grasp, the actinia seizes hold of it, and soon involving all its limbs with the tentacula around the mouth, the victim is gradually dragged into the polyp's stomach, there to perish. All its softer parts, all that can be nutritious, is digested and dissolved, until at length the actinia, being satisfied with its abundant meal, opens again



PTILOTA PLUMOSA.

its mouth, and then regurgitates the shell and what is indigestible. Nor does a little food suffice to satisfy its appetite. The actinia is voracious, harmless and flower-like though it seems; sometimes, for instance, it will swallow whole three or four mussels for a breakfast, and dissolve them all except the shells. Mr. Gosse calls this species the "beadlet," from its possessing a number of blue bead-like tubercles around its mouth. The scientific name of actinia is from a Greek word, meaning "a ray," in allusion to the tentacles. This is a very variable species as to colour, and the commonest of all the sea-anemone family. The actiniae resemble their relatives the hydræ, in their

power of reproducing lost portions of their bodies. If one be cut in two with a sharp knife or razor, each half will grow to a whole animal. When we return home, I will show you beautifully-coloured figures of the British species of sea-anemones, drawn by Mr. Gosse in his book on those animals. There are a great many species, but these shores do not afford much variety. Look, May, at this pretty



CORALLINA OFFICINALIS.

little sea-weed (*Ptilota plumosa*), a very common, but a very beautiful species; it often grows parasitically on the stems of that large strap-like sea-weed, called sea-tangle (*Laminaria*). See how lovely it is now I float it out in water. On the southern shores of England, this alga is not found at all. Here is the vivid-green sea-lettuce (*Ulva latissima*), and here the long *Enteromorpha compressa*. These are capital weeds to keep in an aquarium. Here is a piece of *Corallina officinalis*

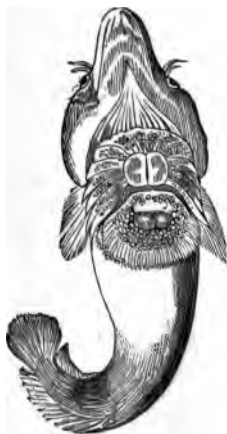
incrusting the stone. Look at its purple-pointed stems, and feel how hard it is; the plant is covered with a coating of chalk. There is a quantity of the very common fucus, or yellow tang, with its thick leathery stems and numerous air-bladders, which crack as we tread on them. But this shore is but scantily supplied with sea-weeds; you must wait till we go to Torquay or Tenby, where you will be delighted



FUCUS NODOSUS.

with the numerous little rock pools left by the retiring tide, and fringed with various kinds of beautiful sea-weed. Here is the purple laver (*Porphyra laciniata*), a capital condiment with roast meat. "Why, papa," said May, "do you mean to say that any sea-weed is good to eat?" Yes, several kinds are used as articles of food; six or seven British species are eaten. There is the *dulse* of the Scotch, and *dillisk* of the Irish, which is eaten in

some parts of Ireland and Scotland. This is the *Rhodymenia palmata*, which, after being washed and dried, is eaten raw. The Irish, or "Carrageen Moss," you may see in almost every druggist's shop, is a seaweed called *Chondrus crispus*. It is used for making jellies, and at one time was used for fattening calves. "We can see no reason," remark Messrs. Johnstone



CORNISH SUCKER.

and Croall, "why many species of sea-weed should not contribute to the luxuries of our tables, and furnish even the poor with a wholesome and nourishing dish. Many of them are composed almost wholly of starch, the principal material for which we are indebted to other vegetables; and why should we not receive them through the medium of plants which grow in the sea as well as on the land?"

“Oh, papa,” exclaimed Willy, “here is such a curious fish under this stone. Now I have got him; do you know what it is?” It is the Cornish Sucker (*Lepidogaster*), so called from having been first noticed on the Cornish coast. It is common enough round our shores. There, do you see? the fish, after a



SNAKE-LOCKED ANEMONE.

slight shake, has attached itself to the inside of my hand. Now I turn it over, and you see underneath the fish's sucker; it is a double disc separated by a groove, and united with the fins. See what a strange-looking head it has, with a long narrow snout. It is of a liver colour, and about three inches long.

Ah! here is another species of actinia; it is the Snake-locked anemone (*Sagartia viduata*), a very pretty kind. See how its tentacles lock together, like so many snakes; it is fond of cracks in rocks, in which it hides itself, but it also lives in the sand.

We have some time to wait yet before the tide will be sufficiently low for us to go to Mr. Parry Evans' Weir Fishery. In the mean time, I will read some account of it, written by the late Archdeacon Jones, of Brynsteddfod:—

“ RHOS-FYNACH FARM AND WEIR.

“ Mr. Parry Evans is said, in Williams's ‘Conway,’ to derive his title to this property by a grant from the Earl of Leicester, 17 Eliz., as a portion of the Lordship of Denbigh. It may be so; but the name of the farm to which the Weir is attached, *Rhos-fynach*—in English, the fen-farm of the monks—would seem to prove that the Weir is of much greater antiquity than that grant. The names of towns, rivers, and farms in North Wales are very ancient, and mark some peculiarity attached to them. Thus, St. Asaph is in Welch, *Llan Elwyn*, “the town on the Elwy;” Holywell, *Treffynou*, “the town near the fountain;” the river Conway, *Cyn-wy*, “the first of rivers,” being the chief river in North Wales. The road across the lowland under Brynsteddfod, *sarn Mynach*, “the causeway made by the monks;” and so I would infer that the Weir, which has been held time out of mind with Rhos farm, from the farm being designated Rhos-fynach, was made by the monks of the abbey of Conway,

when they possessed that farm. In the year 1198, Llewellyn, Prince of North Wales, founded the abbey of Conway, and endowed it with large possessions at Conway, Creuddyn, etc., with the rivers and sea-coast bounding those lands and the fisheries.

“Fish being an article of the first necessity for the food of the monks, it is reasonable to presume that the Weir connected with Rhos-fynach—the farm now bearing that name being not more than three or four miles from Conway—was erected by them during the period they were settled at Conway, from 1198 to 1239.

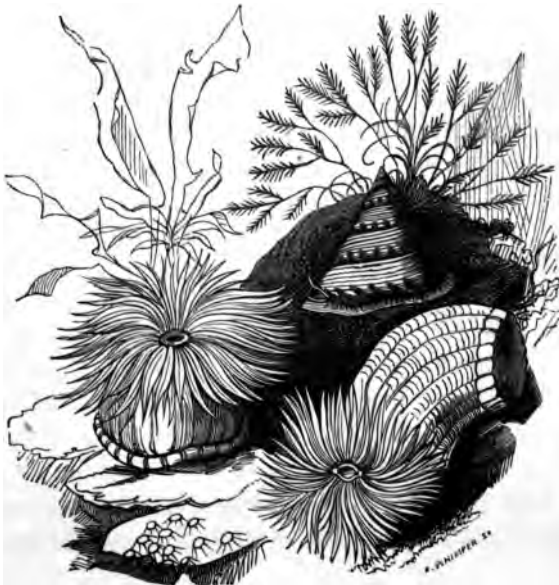
“In that year Edward I., having conquered Wales, and not wishing to have so powerful a body of Welch clergy in his new town of Conway, removed the abbey to Maenan, ten miles from Conway, with the consent of the Pope.

“He at the same time took from the monks all their possessions in Conway, giving them in lieu thereof others of equal or greater value near Maenan.

“The chief possessions of the abbey near Conway were transferred by Edward I. at this time to the Mayor and Corporation of Conway; but it does not appear that Rhos-fynach was included in their grant, nor is there any record of its being within the present boundaries of the Corporation. In fact, the greater part of the corporate property has passed into other hands, *sub silentio*. The facts now stated are presumed to be sufficient to show that the Weir is of great antiquity, and if erected by the monks of the abbey of Conway—and there were no other within twenty or


thirty miles of the place—that it is 650 years old. It may also be shown that it is of the rudest construction, and has never been adapted to modern improvements, and that, consequently, it cannot be removed under the provisions of the Act 24 and 25 Vict. 109.” We will now proceed quietly along the shore to the Weir.

I ought to say that some few years ago the government tried to deprive Mr. Parry Evans of his right to this Weir fishery, but it was decided he had legal claim to the right. A Weir fishery not more than a few hundred yards from his, concerning which a dispute had arisen, was considered illegal; and the shattered remains at present exist to point out the former existence of this fishery.



WALK III.

(Continued.)

E have now reached the Weir; the tide is getting low, and several spectators have arrived, anxiously waiting to see the sport. The Weir, you see, is constructed of large stones and strong wattle work above; it is something of the shape of a V. There is a fine iron grating at the point through which no fish, except the smallest, can escape. Ah! there is the owner of the Weir fishery, Mr. Parry Evans, and his dog, "Jack." Jack came originally from Prussia; his owner calls him an otter-terrier. Some years ago, a schooner came to the coast near Rhos, and the crew, having run short of provisions, landed with the dog. Mr. Evans' attention was drawn to "Jack" by seeing him swim about very cleverly round the schooner, and so he made a bargain with the sailors, and gave them a bag of potatoes in exchange for the dog. "Jack" was then about nine months old, and this happened about eight years ago. Here, Jack, Jack, good dog. See, he comes to us. Do you notice the silver collar round his neck? It cost four guineas, and was made a present to the dog by public subscription, in acknowledgment of his skill

and sagacity as a salmon-fisher. We will now climb on the large stones of the Weir, and look down on the pool so clear and bright. I dare say twenty minutes will yet elapse ere Mr. Parry Evans begins to



HEAD OF WEIR, SHOWING IRON GRATING.

take the fish out. "Oh! look there, look there," said Willy, "something dashed along the water with the swiftness of an arrow." I see; now the fish is right under us; it is a salmon, seven or eight pounds'

weight perhaps. Does he not look splendid in the bright water? Off he goes again like a shot; he will give Master "Jack" some trouble to catch, I'll be bound. "Oh! did you ever see such a beautiful sight as this? Do look, papa; here is a whole shoal of fish swimming towards us." It is a splendid sight, certainly; some three or four hundred mackerel that



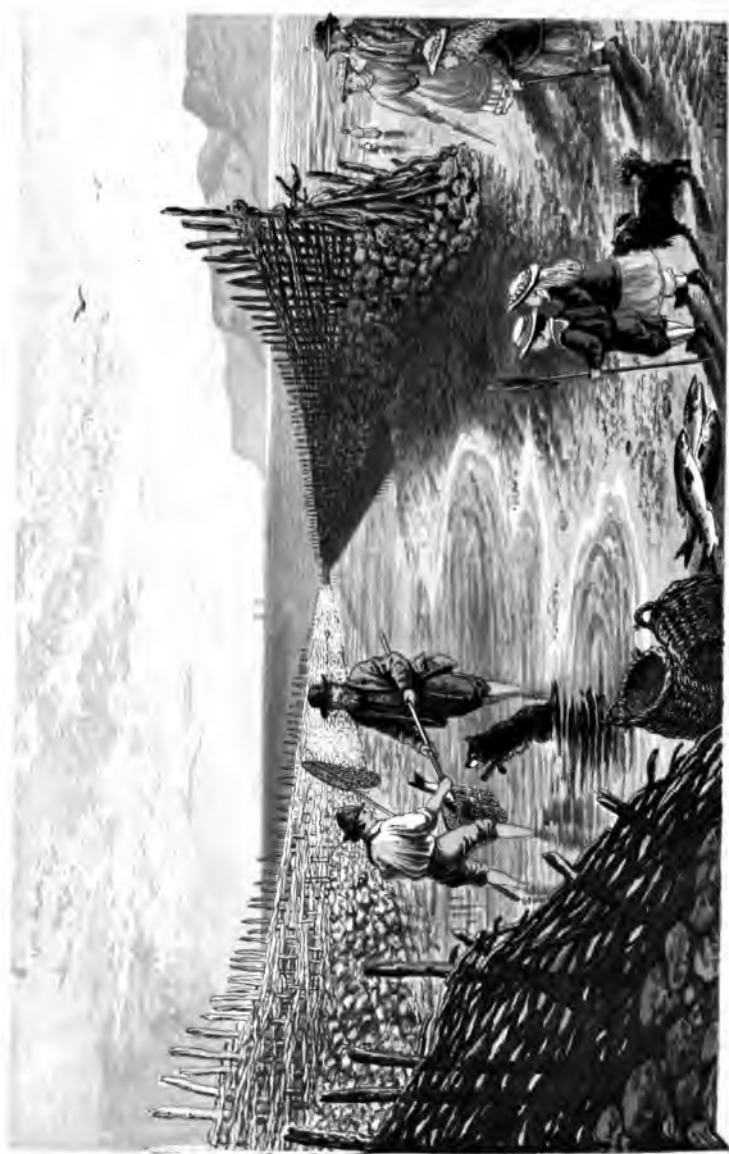
OPEN BOAT FOR MACKEREL FISHING.

have found their own way in, but will have to come Mr. Evans' way out. There they go, with their bright blue backs leaved with green, and beautifully crossed with numerous dark bars or waved stripes. The mackerel is a very valuable fish, and, as you know, very excellent for the table. Enormous quantities of mackerel are sometimes taken in the nets; as many as 15,000 have been taken in a single night off Lowestoft and Yarmouth. At this latter place, the mackerel fishing employs ninety boats, with a tonnage of upwards of

3000 tons and 870 men, producing about £20,000 a year. Mackerel are said to be voracious feeders, and to grow very fast; they should be eaten when very fresh, as the fish would in hot weather soon become unfit for food. On this account, mackerel were allowed to be cried on Sundays through the streets of London in 1698, and I believe the law still exists. Most fish which in the winter retire into deep water, to be out of the way of violent storms—for you know it is only the surface of the sea that is affected by the storms—approach the shores around our coasts in immense shoals, and thus supply excellent food, being caught, as mackerel are, in millions every season. Fish come to our shores in order to deposit their spawn, thus allowing fishermen to take them in their nets or by the line. “Did you ever fish for mackerel with a line?” Willy asked. Yes, I have done so, and caught a few occasionally. Anything bright will do for a bait; a bit of sand-launce is a capital bait. You let the line out a long way, and sail or row quickly through the water.

There goes another salmon; we shall have some sport soon, they cannot pass the iron grating; but just look at these myriads of tiny shining fish, not larger than Jack’s little finger. They are whitebait, and Mr. Parry Evans will fill our basket for us if we like. They are beautiful little things; see how the water glitters with the scales that have been rubbed off by the hand-net. Willy asked whether whitebait was a distinct species, or whether the small fish were merely the fry of other large ones. It was once sup-

posed that it was a distinct species. Mr. Yarrell so thought, and gave it the name of *Olupea alba*, and Mr. Couch is of the same opinion; but other naturalists, and Dr. Günther amongst them, are convinced that whitebait is merely the young of the herring, or at any rate of some member of the herring family (*Olupeidæ*). Now, as there is so much whitebait, there is every prospect of salmon; because the latter fish are exceedingly fond of whitebait, and it is this multitude of shining fry that has attracted the salmon, and retained them within the pool. Mr. Parry Evans tells me, "No whitebait, no salmon." I suspect, too, the mackerel have been similarly tempted. Salmon whilst they are in salt-water are voracious feeders, but it is a curious fact that, as a rule, they do not eat the whole time they reside in our rivers. I have examined the stomachs of scores of salmon, and never found the slightest traces of food from fresh-water specimens; but I have taken as many as four good sized herrings out of the stomach of a salt-water fed salmon. "But, papa," said Jack, "they must live upon something all the months they live in our rivers." They do not take in any food, but are nourished by their own internal fat; and a salmon after it has been long in the fresh water gets very poor and very thin. When once in the sea again its appetite returns, and it soon regains its health and fatness. Mr. Evans jams in a lot of sea-weed, fucus and laminaria, into the iron grating to stop the whitebait from getting through the bars. But see, here comes another shoal. Why, May, just look, are they not queer fellows as



they swim right under us? These are a shoal of garfish. Look at their long, shining, eel-like bodies, and jaws resembling snipes' bills. Oh! do they not look beautiful? they seem to be about a foot long. Mr. Couch tells us that wherever the garfish is found it is a restless, wandering species, having a quick digestion, and always prepared to seize a bait, grasping it with a peculiar action of the protruded jaws. It does not swallow as quickly as some other species, so that when the fisherman's boat is passing rapidly along, the bait is sometimes torn from the fish. When the garfish feels the hook, it does not try to escape by darting away, but annoyed by the restraint of the line, rapidly mounts to the surface, and with body partly out of the water struggles in many active contortions with the line. The garfish seems to have a ready appetite for any animal it can seize and swallow. Mr. Couch mentions as a favourite food a certain black fly which alights on the sea in fine weather; he has seen its stomach filled with these, and also with herrings at about one-third of their growth, a single one in each garfish. "There are times also, when the sea is calm and smooth, that it may be seen in solitary amusement at the surface, or perhaps many together, leaping again and again over some floating object, as a rod or straw; or it may thrust itself bolt upright out of the water, to fall back again in an apparently clumsy manner. It is an amusement for fisherboys to throw some slender stick to the garfish, when it will exercise a variety of evolutions about and over it as it floats." The poor fish, however, are too much frightened

at the presence of so many people to be at all playfully inclined. I ought to tell you that the bones of this fish are quite green. There, Willy, do you see that jelly fish in the water? How different from the lifeless mass we so often see on the shore! Look, how graceful are its movements, as it contracts and expands its umbrella-like disc with slow and even motion. What have we now? Do you see that fish swimming near the bottom with strange-looking head and two magnificent fins spread out fan-like? This is the Sapphirine Gurnard, and is so called from the beautiful blue colour of the inside of the pectoral fins; this is a small specimen, but the species grows sometimes to the length of two feet. There are many British kinds of gurnards, the sapphirine and the cuckoo gurnard being probably the most common. They are very good fish to eat, and often exposed to sale in the Liverpool market; but I do not think I ever saw one in Newport or Wellington; they are caught in trawl-nets, and sometimes with lines and baited hooks. The gurnards are voracious fish; I have seen them coming to the top of the water, and jumping out of it in pursuit of other fish.

Well, Mr. Parry Evans, how many salmon have you counted in the pool? "There are seven or eight good fish in, sir, this time; and one or two will be ten or eleven pounds each." Look at the dog "Jack;" he is evidently getting a little impatient, as he sees in the retiring water of the pool every now and then a salmon darting along. And now Mr. Evans takes the silver collar off, and sets "Jack"

free ; and in a second he is in the middle of the pool. Now for the fun ! Willy and Jack tuck up their trousers, take off their shoes and stockings, and with nets in their hands enter the water. Bah ! it is rather cold at first, but the excitement soon warms them. There goes a salmon, full tilt, and "Jack" after him. What a splashing in the water, to be sure ! There is another dog learning the trade, and "Jack" is his tutor in the art ; he is a brown retriever, and dashes about the water after the salmon as if he enjoyed the fun immensely, but he has not yet learned how to catch a slippery fish. There ! there ! see ! see ! good dog ; now you have him ! No ! off again ; well done, salmon ! Now dog ! have at him !

How immensely rapid is the motion of a frightened salmon. "Quick as an arrow" is hardly a figure of speech. Bravo, "Jack," bravo ! Do you see ? He has caught the salmon firmly by the head. Good dog ! Mr. Parry Evans is immediately on the spot, and takes the fish from old "Jack," whom he kindly pats on the back, holds the salmon aloft for us all to see, and consigns him to the basket which his man is guarding on the shore. See, see, again ! off they go, dogs and men, and soon another salmon is captured ; and there is lots of fun, meanwhile, in catching the mackerel and garfish. How they rush about, poor things, and get dispersed in the commotion. Now, Jacky boy—not Mr. Evans' dog—you have that long-nosed garfish. No, he has wriggled off. Well, try again. Well done, you have him this time. Take him to the basket. What ! you think he will bite ?


Not he. There, you have let him go. "Well, papa, he was so slippery, you know." Never mind, there are lots more. Now, Willy, work away. There goes the dog again, helter-skelter all, dogs and men, and another salmon. "How beautiful the fish look now they are landed!" said Mr. Parry Evans. It was a very natural remark. To my eye, they looked prettier swimming in the pool; but practically, they were better for all, no doubt, in the net. Well, the sport of catching the various fish in the pool—there were nine salmon, averaging about five pounds each—lasted about half an hour. "Jack" behaved admirably; it was wonderful to see his skill in the pursuit; he generally caught hold of the salmon by the head, on which he gave one strong bite, and the fish was rendered helpless almost instantaneously. Sometimes he would catch hold of the back fin. When the sport was finished, we went to survey the spoils; and a nice "kettle of fish" there was. I bought one salmon and the gurnard; the rest were soon disposed of by Mr. Evans to his numerous visitors, all of whom were much pleased with the sport. But wait a little; some of the fish lie on the sand. I will look for parasites. Here, on this salmon, is a curious parasite, with a body an inch long, and with two long tail-like projections three times the length of the creature itself. It is a crustacean, and related to the *Argulus foliaceus* we have found abundantly on trout in the rivers in Shropshire.* Those two long tails are tubes containing eggs; they remind me at

* See "Country Walks," p. 71.

once of the egg-sacs of the small crustacean *Cyclops*, so common in fresh-water ponds. There are some smaller parasites on the same fish, and somewhat similar in form, but without the tail-like ends. These are the males of the same creature. The name of the parasite is *Lepeophtharies stromii*. Had it a short English name, I would have given it you instead. The old dog, no doubt, thinks he has done a good day's work, and walks quietly behind his master home; and we are all of the same opinion as the old dog, and leave Rhos-fynach Weir Fishery with impressions that will perhaps never be effaced.



WALK IV.

E will stroll again on the shore, and look out for some plants on the dry part furthest from the tide. We shall find plants that we never see in the country, being peculiar to the sea-shore. Here, for instance, is the Sea-holly (*Eryngium maritimum*) with its thick prickly leaves of a glaucous hue, prettily veined with white. You see it grows abundantly here, and a very handsome plant it is, with its dense heads of blue flowers; the roots which penetrate the sand to a great depth are slightly bitter; a preparation of them was made many years ago, with sugar, in the form of sweetmeats. They were called "kissing-comfits." Shakespeare refers to them when he puts into the mouth of Falstaff the following words: "Let the sky rain potatoes; let it thunder to the tune of *Green-sleeves*; hail kissing-comfits and snow eringoes, I will shelter me here."

Colchester was long famous for these sweetmeats. The root of the sea-holly was supposed to have a tonic property, and I believe it is still used by some people as a medicine. In Sweden, the young topshoots are eaten like asparagus. It is a hardy plant,

and preserves its colour and form for a long time after it is gathered.

Eryngo, to the threat'ning storm
With dauntless pride uprears
His azure crest and warrior form,
And points his spears.

Here is the Sea-spurge (*Euphorbia paralias*), with its curious yellowish-green flowers and glaucous leaves. You see, when I break a bit, what a quantity of milky fluid flows out. All the species of the spurge tribe (*Euphorbiaceæ*) abound in this juice, which is extremely acrid. If you were to put a drop on your tongue and swallow the smallest morsel, you would feel a burning heat in the mouth and throat for hours. Large draughts of milk allay this unpleasant sensation. Old Gerarde, speaking of the sea-spurge, says—
“Some write by respect of others that it enflameth exceedingly, but myselfe speak by experience; for walking along the sea-coast at Lee, in Essex, with a gentleman called Mr. Rich, dwelling in the same towne, I took one drop of it in my mouth, which, neverthesse, did so inflame and swelle in my throte, that I hardly escaped with my life. And in like case was the gentleman, which caused us to take our horses, and poste for our lives to the next farm-house to drinke some milke, to quench the extremitie of our heate, which then ceased.”

“Oh, papa, look there! what is that large bird flying near the sea—it cannot be a gull?” said Jack. No, it is a cormorant. I will tell you something about

cormorants just now, but I want you at present to hear a little more about this curious family of plants. I said that the milky juice of the spurges is poisonous; and do you know, Willy, that the Irish peasants of Kerry are said to collect a lot of spurge, and, after bruising it, to put it in a covered basket and sink it in the river, for the purpose of poisoning or stupefying the fish. Some of the members of this order, which grow in tropical countries, are fearfully poisonous. I do not know whether I ever told you of the Manchineal-tree of the West India Islands. It is said to be dangerous even to sleep under its shade, and that the land-crabs, so frequently found in the Manchineal woods, acquire their poisonous properties from them. There may be some exaggeration, perhaps, in the stories, but the fact that the Manchineal is exceedingly poisonous remains. Then there is the Manihot of the same order of plants, a shrub much cultivated in tropical countries, which contains a very poisonous substance. "I do not see," said Jack, "what is the use of cultivating poisonous plants." Well, I was going to explain that the Manihot abounds in starchy matter, that the poisonous properties can be completely driven off by roasting or washing, and that the starch is then converted into what is known as Cassava-bread, a palatable and nutritious article of diet. The Indians use the juice of this shrub for poisoning their arrows. "I should not much fancy," said May, "the Cassava-bread." You actually have occasionally eaten nearly the same thing; that is, if you have ever eaten tapioca-pudding, which is pre-

pared from the starch of the roots of the bitter Cassava. The Sandbox-tree, also a native of the West Indies, sometimes called by the funny name of the Monkey's Dinner-bell-tree, is another dangerous plant, the milk of which is so venomous as to produce blindness if applied to the eye. Castor-oil—don't shudder Jack—is produced from a tree which belongs to the spurge family; the poisonous property remains behind, and is not expressed with the oil from the seeds.

"There goes another cormorant," exclaimed Willy; "are not these birds capital fishers?" Yes, indeed they are; and they used formerly to be trained to catch and bring fish to their masters. There are two British species of cormorants—the great cormorant and the shag. They are both splendid divers; the shag has been caught in a crab pot a hundred and twenty feet below the surface. I like to see these birds perched on some craggy eminence overhanging the sea, or flying along with steady flight. The great cormorant makes a large nest of sticks, seaweed, and coarse grass, and lays four or five eggs of a white colour varied with pale blue. I never saw a very young cormorant, but they must be queer-looking fellows; for when first hatched they are covered with a bluish-black skin, acquiring a thick covering of black down in the course of a few days. Cormorants have very wide throats and can swallow large fish. Eels are dainty morsels with them; a cormorant has been seen to pick up an eel from the mud, return to the rail he was previously sitting upon, strike the eel

three or four hard blows against the rail, toss it up into the air, and catching it by the head in its fall, swallow it in an instant. "I should much like," said Willy, "to possess a tame cormorant, would it not be fun to teach it to catch fish for us?" Cormorants possess great intelligence. I think it is Colonel Montague who tells us of one that became so tame that it never seemed happy unless in the presence of its owner. "But to this day in China," Willy remarked, "the people use tame cormorants for fishing purposes, do they not?" Yes, I believe so. Here is an account given by a traveller in that country: * "There were two small boats, containing one man and about ten or twelve birds in each. The birds were standing perched on the sides of the little boat, and apparently had just arrived at the fishing ground. They were now ordered out of the boat by their masters; and so well trained were they that they went on the water immediately, scattered themselves over the canal, and began to look for fish. They have a beautiful sea-green eye, and quick as lightning they see and dive upon the finny tribe, which, once caught in the sharp-notched bill of the bird, never by any possibility can escape. The cormorant now rises to the surface with the fish in his bill; and the moment he is seen by the Chinaman he is called back to the boat. As docile as a dog, he swims after his master and allows himself to be pulled into the san-pan, where he disgorges his prey, and again resumes his labours. And, what is more won-

* Fortune's "China," p. 99.

derful still, if one of the cormorants gets hold of a fish of a large size, so large that he would have some difficulty in taking it to the boat, some of the others, seeing his dilemma, hasten to his assistance, and with their efforts united, capture the animal, and haul him off to the boat. Sometimes a bird seemed to get lazy or playful, and swam about without attending to his business; and then the Chinaman with a long bamboo which he also used for propelling the boat, struck the water near where the bird was, calling out to him in an angry tone. Immediately, like the truant schoolboy who neglects his lessons and is found out, the cormorant gives up his play and resumes his labours. A small string is put round the neck of the bird to prevent him from swallowing the fish which he catches."

The shag is a smaller bird than the greater cormorant, and is of a more decided green colour. It is said never to quit the salt water to follow the course of a river, as its relative does, and never to settle on trees. The word cormorant means "sea-raven."*

There is another interesting bird flying past; it is the common tern, or sea-swallow. See how rapidly it flies, now skimming near the water, now rising aloft. It is on the look out for fish, and is a very graceful bird, and has a beautiful red bill and feet. I have seen this tern occasionally in the middle of Shropshire. There are several British species of terns; they all come to this country in May, and leave it in September. They lay two or three eggs of a yellowish

* *Corvus marinus.*



TERN FEEDING YOUNG.

stone colour, spotted with grey and dark red-brown, and take great care of their young ones. Mr. St. John says that the terns are very fond of sand-eels (sand-launces), and that though "the swiftest little creature in the whole sea is the sand-eel, yet they catch thousands of these fish in the same way as the osprey catches the trout, excepting that the tern uses its sharp-pointed bill, instead of its feet. I have often taken up the sand-eels which the terns have dropped on being alarmed, and have invariably found that the little fish had but one small wound, immediately behind the head. That a bird should catch such a slippery active fish as the sand-eel, in the manner in which a tern catches it, seems almost inconceivable, and yet every dweller on the sea-coast sees it done every hour during the period that these birds frequent our shores." Mr. St. John also informs us that when the day is bright and the sun hot, the terns hovering constantly over their eggs, leave them to the heat of the sun reflected from and increased by the warm shingle. Let us get nearer to the water, the tide is getting low; here is a large shore-crab scuttling away as fast as his legs can carry him. Crabs are grotesque fellows, and it is most laughable to watch their doings in an aquarium. Let us catch this fellow, but mind he does not bite us; how many legs has he? count them, Jack. "He has got four on each side, papa, and he wants to bite me with his claws." See how strong the claws are; the crab uses them as a man uses his hands. It is amusing to see a crab in an aquarium quietly helping himself to some dead shell-

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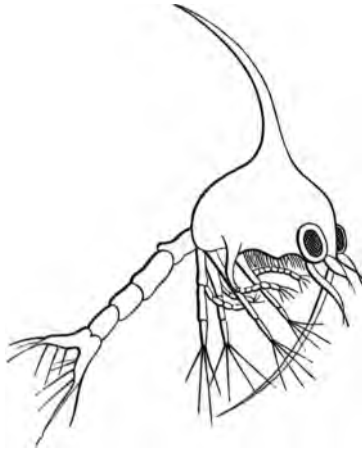
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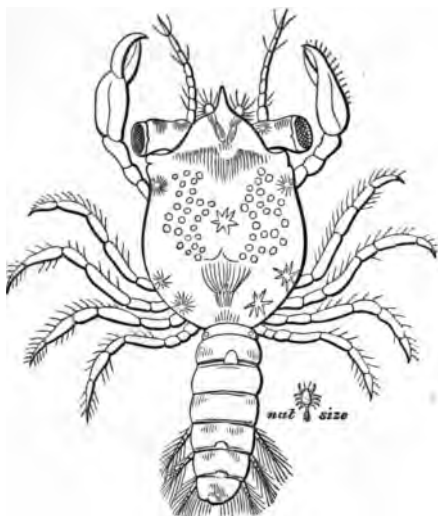
fish or other food; he picks a bit off and hands it to his mouth "almost like a Christian," as country folks sometimes say. Fish, flesh, or fowl, fresh or putrid, is duly appreciated by Mr. Crab. Crabs, like other crustacea cast their shells. It is most curious to notice how perfect is the cast-off shell; the antennæ, the bristles, the eyes, the hairs, the most minute parts are seen in the old shell. The crab who has thrown off his old crusty



FIRST STAGE OF YOUNG CRAB.

coat, remains for some time in a soft state, but in course of time constructs another shelly coat from the mineral particles in the water. Willy wished to know whether crabs underwent any metamorphosis like insects. The metamorphosis of the crab is an extremely instructive and interesting subject. The

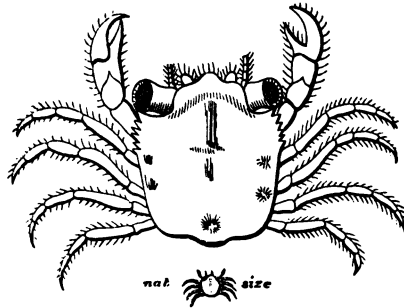
eggs are carried under the tail ; and when first hatched, the young are most strange looking creatures. I have seen these little things swimming about like an animated mass of dust in an aquarium. On submitting a few specimens to microscopic examination, I



SECOND STAGE.

soon found I had under inspection the young of the crab. When in its earliest stage the creature was first observed, it was supposed to be some new thing altogether, and naturalists called it a *zoea* ; in its second stage of transformation it looks more like a crab ; and still more so in its third stage ; finally it assumes the adult crab form.

"But this is not the kind of crab that people eat," said May, "is it?" No; the crab you see exposed for sale in the markets is the edible crab



THIRD STAGE.

(*Cancer pagurus*). It prefers rocky coasts, and I do not think we are likely to find any on this sandy shore. Indeed, the large specimens of this species



CRAB-POT.

live out far from the shore in deep water. Crab-fishing is a very important trade on many parts of our coast. Immense numbers are taken in what are called

crab-pots; these are round traps or baskets made of wicker-work, the twigs of the golden willow (*Salix vitellina*) being much used on account of their toughness. "But how do the crabs get into these traps?" asked Willy. The traps are baited with pieces of fish or any offal, and are sunk by stones attached to the bottom; a long line, fastened to the trap with a



RHODYMENIA PALMATA.

cork at the other end, shows where the trap is situated. A crab-trap is not unlike one kind of mouse-trap, only the entrance is at the top and not at the sides. Putrid flesh is the usual bait to which it is probable the crab is attracted by the sense of smell.

Here, on an old oyster-shell, is a bit of very pretty pink sea-weed, called *Rhodymenia palmata*. The

first-named word means "red leaf," or "membrane." It is common all round our coast, and is a pretty plant for an aquarium.

"We are not aware," say Messrs. Johnstone and Croall, "that it is eaten anywhere in Scotland at the present day as an article of food, although it is said to have been so at one period, and it is still much eaten as a relish by all the inhabitants that live near the coast. It is always, we believe, eaten in the raw state; but we remember seeing, when a boy, some people giving it a slight scorching or roasting by rolling it round a heated poker, after which it had a very peculiar flavour, which to most persons, as well as to us, was very disagreeable. By this process the red colour was changed to green. Those specimens which are covered by parasites, such as *Calithamnion* and *Ectocarpus*, are generally most in request; and many persons consider it no disparagement that a few of the smaller crustacea (*Idotea*) and minute shell-fish (*Rissoa* and young *Mytilus*) form a part of the delicate morsel. When sold in the markets, or hawked through the towns or rural districts, as it often is during the summer months, the young stems of *Laminaria digitata* (tang or tangle) are generally mixed up with it; and also a sprinkling of pepper dulse (*Laurencia pinnatifida*)."*

Now, May, take a bite; there are no parasites on this bit, and you will be able to report on its character as food. "No, thank you, papa," said May; "it is very pretty, but the smell is not very inviting."


* "Nature Printed Sea-weeds," ii. p. 12.

Here is a tuft of a zoophyte called "Lobster's-horn," growing on a stone imbedded in the sand; you see each branch is jointed like the antennæ of a lobster. A row of small cups extends at regular intervals down the inside; these are the houses of the polyps. Here is *Plumularia falcata*, a very elegant little zoophyte, and here is *Campanularia verticellata*. Let us put them in one of our small boxes for examination under the microscope. What wonderful variety there is in nature!

New buds and bulbs the living fabric shoots
On lengthening branches and protruding roots;
Or, on the father's side, from bursting glands,
Th' adhering young its nascent form expands;
In branching lines the parent trunk adorns,
And parts, ere long, like plumage, hairs or horns.



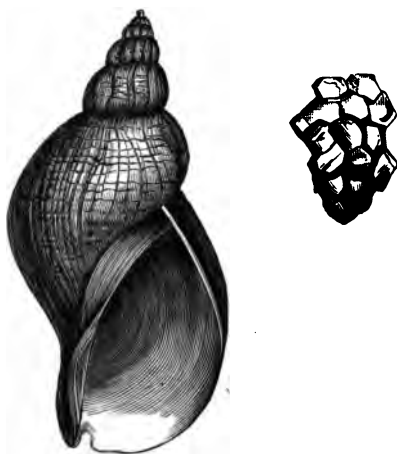
WALK V.

E will take the train and visit Rhos-fynach once more, and after seeing the fun at the Weir, we will turn over the stones and examine the rocks at low tide; we shall no doubt meet with many interesting specimens of animals, and I dare say get a few pretty sea-weeds from the rock pools. On the sands, we found a large univalve shell; there was, however, no animal inside it; the shell was that of a whelk (*Buccinum undatum*). Put it to your ear, Willy, and listen to the murmurings. "It seems to make a curious noise, papa," Yes, this shell is "the roaring buckie" of Scotch children. Wordsworth alludes to this idea in the following lines—

I have seen
 A curious child, who dwelt upon a tract
 Of inland ground, applying to his ear
 The convolutions of a smooth-lipp'd shell;
 To which, in silence hushed, his very soul
 Listen'd intensely, and his countenance soon
 Brightened with joy: for murmurings from within
 Were heard, sonorous cadences, whereby,
 To his belief, the monitor express'd
 Mysterious unions with its native sea.

The whelk, of which there are many varieties, is a common mollusc in all parts of the British seas. The

animal is very voracious ; it has a yellowish body streaked with black, and a long powerful proboscis, within which is a muscular sheath that contains a very curiously-formed tongue. This tongue is a beautiful microscopic object, and when we get home again, I will show you its form and structure. The creature burrows in the sand. I have often taken specimens out dredging. Mr. Gwyn Jeffrey's says he has seen between



WHELK-SHELL AND EGG-CASES.

thirty and forty shells of this mollusc taken from the stomach of a single cod. "Do any people eat whelks as they eat cockles and periwinkles?" asked Jack. I believe vast numbers are eaten in London, where you may often see them exposed for sale. According to Mr. Mayhew, as many as four million, nine hundred and fifty thousand whelks are sold in the streets of London every year. They have from very early

times been eaten in this country ; and when the Romans were in England they acquired a taste for whelks. "How do you know that, papa?" said May. Because whelk-shells have been found mixed with oyster-shells at Richborough, in Kent, an old Roman station. We know that the old Romans were very fond of shell-fish. Snails were dainty morsels ; and do you know they used to eat sea-urchins and sea-anemones? Even bishops and archbishops used to eat whelks, for in 1504, when William Warham was made Archbishop of Canterbury, eight thousand whelks were provided for the feast at five shillings a thousand. I should like to see archbishops now-a-days eating whelks. In the shell-fish market at Billingsgate, the present species goes by the name of the "white," or common whelk, in contradistinction to the *Fusus antiquus*, which is there called the "red," or "almond" whelk ; they are brought chiefly from Whitstable, Ramsgate, Margate, Grimsby, and Harwich.*

Wilks—the word is spelt in different ways—must be sold during the same day they are received, that is, the day after they are caught. If the supply is greater than the demand, they are boiled, in which state they keep good for several days. "Evidence was given before a Select Committee of the House of Commons in the Session of 1866, on the Whitstable Oyster-Fishery Bill, that the whelk-fishery on a sandy flat in that bay yielded £12,000 a year—part of the produce being disposed of in the London market for

* Jeffrey's "British Conchology," iv. p. 290.

food, and the rest sent to the cod-fishery banks for bait. They are seldom eaten in the northern part of our isles. At Dieppe, and Nantes, they may occasionally be seen exposed for sale in the fish-markets."

"What is this light ball?" asked Willy, giving it a kick. That is a cluster of the egg-cases of the whelk we have been talking about. Some people call them "sea-wash balls," because sailors are said to use them instead of soap to wash their hands. You see it is made up of a number of round pockets, one upon the other, and attached by their edges at the base; perhaps there may be four hundred of these pockets, and each pocket may contain several hundred eggs! Now there is a very curious fact about these eggs; though there are so many at first, perhaps not more than twenty or thirty come to be young whelks. What has become of the other eggs? Some say that the eggs are first spherical, but that afterwards they unite and form bodies of a different shape; but Sir John Lubbock, a most accurate observer, says that the more forward young ones swallow the other eggs whole; and he has drawn a figure of a young whelk in the act of swallowing an egg. I believe that this is now generally accepted as the true explanation.

"What have we here, papa," said Willy, "on these large rough stones?" Ah! that is a kind of cousin of the whelks; you see the shells are not very dissimilar in shape, but much smaller. There are dog-whelks (*Purpura lapillus*), and you observe also on the stone a lot of things shaped something like miniature egg-cups, are they not curious? Those dog-

whelks, or whelk-tingles, are very injurious to oysters, and destroy vast numbers. "But how," asked Jack, "can they get at the oyster, surrounded as he is by his hard shelly coat?" The whelk-tingle has a long tongue which has a number of flinty spines upon it; by working this tongue round and round a hole is at length bored in the oyster's shell. The process is no doubt a slow one. It has been noticed that it took two



DOG-WHELK AND EGG CASES ON STONE.

days to get through the shell of a moderately-sized mussel. This mollusc secretes a purple dye, which was formerly used by the monks in illuminating their Biblical manuscripts. I will break one of these dog-whelks; do you see the slightly yellow fluid? "But, papa, you said it was purple," said Willy. Well; wait a minute, you will see it change colour; it is assuming

a greenish hue ; watch it a little longer, now it is violet, now it is purple : this change in the colour is due to the action of the sun. Let us look into this rock pool. There goes a fish, let us catch him. "Oh ! what an odd-looking thing ; it is something like an eel," said Jack. It is not an eel, but one of the pipe-fishes ; what an extraordinary head it has ! Its mouth, you see, is a cylindrical tube ; the jaws being united, the gills are not formed as in most fishes, but are arranged in small tufts. It is a curious fact to notice in the history of these pipe-fishes that the male has a membranous pouch on the under part, near the tail, into which the eggs of its mate are put ; here they are developed into young ones, and herein they are sheltered from danger. Mr. Yarrell says that he has been assured by fishermen that if the young were shaken out of the pouch into the water over the side of the boat, they did not swim away, but when the parent fish was held in the water in a favourable position, the young would again enter the pouch. "But, papa," said Willy, "as the jaws are united how can the fish open its mouth when it wishes to eat?" It cannot separate its jaws of course, but it sucks up the water through the opening of the tubular mouth by dilating its throat. The food which consists of small crustacea, worms, etc., is drawn into the mouth as water is into a syringe. Those curious little fish called sea-horses (*hippocampi*)* of which you may remember I have a pickled specimen at home, belong to the pipe-fish family, and resemble them a good deal

* See Plate, Fig. 3.

in their habits. The short-nosed hippocampus is occasionally met with on our English coasts; it swims about in a vertical position, ready to grasp with its tail any object in the water. It is from six to ten inches long; the body is much compressed, the tail divided by many ridges, and very prehensile. The eggs and young are protected in the pouch of the male as in pipe-fishes. "You do see most extraordinary forms of fish," said Willy, "and the hippocampus is certainly one of them; for though we are not likely to meet with any specimens here, I remember the one you have in a glass vessel at home." Yes, and you remind me of a most curious member of the pipe-fish family that inhabits the Indian seas—the foliated pipe-fish (*Syngnathus foliatus*), whose head, back, and tail are provided with a lot of leaf-like appendages set in strong, rough, spiny projections, giving it a sort of "rags and tatters" look. You would suppose at first



DELESSERIA SANGUINEA.

sight that these "rags and tatters" were leaves of sea-weed that had been transfixed by the spiny pro-

jections. "Oh papa, do come here," cried May; "here is such a lovely bit of sea-weed growing hidden under this crack in the rock." It is the *Delesseria sanguinea*, most beautiful indeed. Look at its brilliant crimson pink colouring, its delicate membranous frond with midrib and branching veins; it is, however, somewhat torn now; had we found it in the month of May it would have been in a better state of preservation.



PHYLLOPHORA RUBENS.

Ah! another bit of pretty sea-weed (the *Phyllophora rubens*), it is of a bright transparent red colour, and of a firm substance; it loves to hide under the projecting ledges of little rock pools.

Here is another small fish; what is he, Jack? "He has retreated under a stone, but I will soon fetch him out." There, now you have him; let me look. Oh! I see, it is a specimen of the shanny (*Blennius pholis*), common enough in most

parts of our coasts; it differs from other *blennies* in the absence of any appendages on the head. The shanny confines itself to the bottom, where it takes up its residence on a rock or stone, from which it rarely wanders far, and beneath which it seeks shelter from ravenous fishes and birds; for cormorants, with their long and sharp beaks, drag multitudes of them from those retreats, and devour them. When the tide is receding, many of these fishes hide under the stones or in pools; but the larger individuals quit the water, and by the use of the pectoral fins creep into convenient holes, rarely more than one in each, and there, with the head outward, they wait for a few hours, until the return of the water restores them to liberty. If discovered or alarmed in these chambers, they retire by a backward motion to the bottom of the cavity. "Lacepede records an instance, where, as he supposed, a shanny had made an attempt to feed on an oyster that lay with its valves open, in consequence of which it became shut up a prisoner by the closing of the shell. In this condition of confinement the fish had continued so long that the oyster had been dredged and carried to a considerable distance, when, on opening it, the captive was again set free, alive and without injury."* Like the chameleon, the shanny can turn its eyes in opposite directions. "Oh! what is this very beautiful little creature, crawling on a bit of laminaria," asked May; "is it not lovely?" It is one of the nudibranchiate molluscs, an extremely interesting and very elegant

* Couch's Fishes, ii. 228.

family. Let me put it in my bottle. There, now we see it more clearly ; look at the tufts of a delicate rose-colour which adorn its back ; these are the creature's lungs, and as they are exposed, the term *nudibranchiate*—naked-gilled—has been given to these molluscs. This specimen is the *Eolis coronata*, one of the most beautiful of the tribe. The body is about an inch long, slender, tapering to a point, of a transparent watery-white, tinged with rose-colour and buff. It has four appendages—two near the mouth, called the oral tentacles, and two on the back part of the head, called the dorsal tentacles. The branchial tufts form six or seven clusters down each side of the back ; they are of a beautiful rose-red colour, slightly tinged with blue. It looks like a miniature bed of animated flowers. A great number of various species of nudibranchiates have been described as belonging to the British fauna. I am always much delighted to find specimens. The early spring, however, is the best time, I believe, because these molluscs at that time approach the shores for the purpose of depositing their spawn on the underside of rocks and stones near low-water mark. The spawn is a jelly-like thread, arranged in several spiral coils, within which the eggs are imbedded. See how gracefully the little creature bends its tentacles ; now extended, now suddenly contracted, as they come in contact with something. But do you know that, charmingly beautiful as many of these nudibranchiates are, they are often sad cannibals. That they will devour the tentacles of the sea-anemones I myself have had proof of. Messrs. Alder and Han-


cock in their beautiful book on these molluscs, which I will show you when we get home again, say that they had several opportunities of noticing the carnivorous propensities of this species, which is certainly not the least voracious of its tribe. "After having been for a day or two without food, they will even devour their own kind—the weaker falling a sacrifice to the cravings of the stronger. Large individuals will content themselves with plucking off each other's papillæ; but should a smaller specimen be within reach, it is most mercilessly attacked, the more powerful animal laying hold of any part of the weaker that may happen to be nearest. The tail, however, is generally first seized, and fierce and determined is the onset. The devourer raises and shakes his papillæ in the manner that the porcupine shakes its quills when irritated, and then, laying back the dorsal tentacles, and curling up the oral ones, fixes the protruded mouth and jaws upon his prey, when, with a convulsive shrinking up of the body, morsel after morsel is appropriated. In this manner it is not uncommon to see an individual entirely devour another half its own size."

"Oh! papa," said Jack, "do come; here is a very unpleasant-looking creature which I do not like to touch. I found it under this flat stone; I suppose it is some kind of worm." It is a worm, and a very curious one too; and, I must confess, not prepossessing in appearance. It lies coiled up in numerous irregular entangled convolutions, which it would appear impossible to unravel. It is about a quarter

of an inch thick, of a dark reddish-brown colour, and may be six or seven feet long. It is the Sea Long-worm (*Nemertes Borlasii*). Specimens are said sometimes to attain the enormous length of thirty yards. The mouth is a longitudinal slit; and inside it is a long tubular proboscis. Sir J. Dalyell, who once kept one of these strange creatures in confinement, says: "He was a long time perplexed regarding the food of this worm; a creature so unwieldy and unmanageable in itself appeared to be very ill-adapted for overcoming any resisting prey. In the natural state, it certainly enters the tube of an *Amphitrite* to devour the tenant; and in one instance it seized and devoured a *Terebella* before me, which had lost its protective dwelling; and this, too, in spite of the size and apparently superior strength of the prey. It feeds on mussels also." I have occasionally met with this worm, but am glad to have another opportunity of studying it. We will take it to our lodgings.



WALK VI.

E will take the train to-day and visit Llandudno, and enjoy a stroll round the Great Ormeshead; the day is tolerably clear, and we shall have a lovely view.

We soon arrive at Llandudno, and at once make our way to the Great Ormeshead. Various plants soon attract our attention, for the rock of the Ormeshead is limestone, which is favourable to a varied vegetation; and one British plant, the *Cotoneaster vulgaris*, is found nowhere else, in a truly wild state, in the kingdom. I remember finding it many years ago growing on a limestone ledge looking inland; it will take us out of our beat, however, to search for it now. The cotoneaster is a shrubby plant with small rose-coloured drooping flowers and dark-green leaves, producing in the autumn very pretty red coral-like berries. It is often cultivated in gardens, and is no doubt familiar to you all. I will remember the next time I see it to show you the plant. "Oh, papa," said May, "what is this pretty yellow flower growing so abundantly here?" It is the rock-rose (*Helianthemum vulgare*), see how beautiful the blossoms look, as the bright

sunshine tinges their sides, and opens out the golden petals. The rock-rose, or cistus, as it is also called, never opens its petals except when skies are bright; see how sensitive the stamens are. I touch them with this pin, and at once they lie down on the petals, where they remain for a long time. Here is another species, the Hoary Dwarf rock-rose¹ (*H. canum*); its leaves are quite grey with down, hence its Latin name; the flowers are yellow like the common species but smaller. It is a very rare species, so we will take a few specimens home and dry them. Here is another uncommon plant, the Nottingham Catchfly, as it is called (*Silene nutans*); there are several kinds of catchflies, and I dare say we shall find some more of them in the course of our ramble. "What a curious name," said Jack, "to give to a flower!" Yes, it is so called because many small flies are often caught in the sticky fluid which in some species surround parts of the stem. The starry blossoms are very pretty in the evening, and very fragrant; you will detect neither beauty nor odour now, for this flower loves to unfold in the evening, unlike the rock-rose which loves the bright sunshine. The Nottingham Catchfly is one of

The flowers that shun the blaze of noon,
To blow beneath the midnight moon;
The garish world they will not bless,
But only live in loneliness.

The odour it gives forth is so powerful as to be unbearable in a room.

"Here," said May, "is another very beautiful plant; do you know its name?" Indeed it is very pretty, with its spike of bright blue blossoms; it is the Spiked Speedwell (*Veronica spicata*), and is, I believe, a rare plant, never growing except on limestone or chalk. I have often seen this species cultivated in gardens where the spikes of blossoms sometimes grow to nearly a foot in length; gardeners call it the "Cats' Tail Speedwell." "Papa," said Jack, as we had walked nearly half way round the Ormeshead, "it is very hot, let us sit down here in the shade and rest." A very good idea, Jacko; we have plenty of time before us, and we will look out on to the sea and refresh ourselves for half an hour. "What is that island nearly opposite us?" Willy asked; "it is an island, is it not, papa?" Yes, it is Puffin Island, so called from the great numbers of birds called puffins that used to visit it. "Is that a fishing-boat we see in the distance?" asked Willy. I have no doubt it is a trawler, and probably has a lot of fish on board, most of which will perhaps find its way to the Liverpool market. "What is a trawler?" May asked. It is a fishing-boat which carries a net called a trawl. Some years ago it was a common thing for the steam-boats plying between Beaumaris and Liverpool to stop for a few minutes off Puffin Island, and take in baskets of fish from the trawlers that came alongside; these the steamer took to Liverpool. "I should think," said Willy, "it must be good fun being in a trawler, and seeing the fish and other curious creatures secured in the net. Have you ever seen fish

taken in a trawl-net?" Yes, and while we are resting I will describe partly in words I used some years ago elsewhere, the trawl-net and the mode of working it. The trawl is a purse-shaped net, between sixty and seventy feet long, about forty feet wide at the mouth, and gradually diminishing to four or five feet at the commencement of the smaller end of the net, or "cod," as it is technically termed. This narrow part is about ten feet long, closed at the end by a draw rope. The net is kept open at its broad mouth by a wooden beam, which is fixed upon two upright iron



TRAWL-NET.

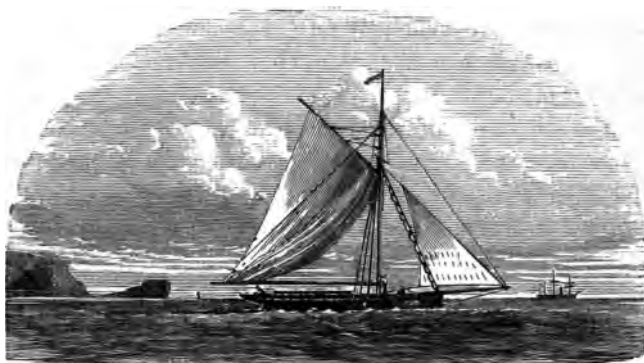
frames three feet high, one at each end; these are called the "trawl-heads." The bottom part of the trawl-head is flat, to rest upon the ground. The underside of the net corresponds to the back, excepting at the mouth, where it is curved deeply inwards; along this portion runs the "ground rope," extending from one trawl head to another; when the net is on the ground, this rope rests upon the bottom. The net has pockets, one on each side, and its meshes vary in size from four inches square near the mouth to an inch and quarter square in the cod. The cod portion of the

net is protected by pieces of old worn-out nets, the upper part being of Manilla twine for buoyancy, the lower of a heavier kind of hemp. Well, suppose the men are hoving the trawl over the side of the vessel. Down sinks the net, beam uppermost; a hundred fathoms of the warp, which is immensely strong, and as thick as a man's wrist, are payed out, the depth of the water being about twenty-five fathoms. The trawl-heads are evidently on the ground, for had the net capsized, the men would have known by the jerking of the warp. All is right, and the net is drawn in the direction of the tide, gradually adding to its enclosed stock of fishes. The ground is smooth, a necessary condition for successful trawling, as rocky ground soon tears the net to pieces. The trawl-irons rest on the bottom, and the inside curved margin of the net, with its border of ground-rope gently rubs the noses of the fish before it.

It is the nature of fish to lie with their heads opposite the stream, so when the ground-rope warns them to "move on," the fish dart forward. If they take their way upwards, the advanced part of the net prevents their escape; if they find their way to the lower portion of the net, they are almost sure to be caught in one of the pockets.

The smack has been towing the trawl at the rate of a mile an hour faster than the tide, and now the master has given orders for "hauling," or recovering the trawl-net. The bulwarks of the smack are taken away, and hauling begun by the help of a windlass. Steadily the warp with its heavy burden is drawn up,

and the great trawl pulled on deck. What a scene of excitement as fish of various forms and colours are emptied out of the cod and pockets ! what flapping of fins, shaking of tails, opening and shutting of mouths ! Crawling crabs of grotesque form scudding away, some with legs like a spider, others with the soft part of their bodies encased in the deserted shells of univalve



YACHT FOR TRAWLING.

molluscs ; old oyster-shells perforated by a boring annelid with numerous round small holes, and now become the habitations of sponges, bearing on their surfaces delicate forms of serpulæ, whose diminished heads are hidden within their tortuous tubes ; various starfishes ; the red sun-star, the fragile ophiuræ, the snake-armed ophiocomæ, the common five-fingers, detested by oyster cultivators for the mischief it causes amongst those highly-prized molluscs, crawling worms of various species and of rainbow hues in their own

element, though now exhibiting but few attractions. We observe, also, many sea urchins (*Echini*), some as large as a baby's head, others small as a walnut, with purple spines of different sizes and forms, sea-cucumbers, polyzoa, and zoophytes in abundance, tunicated molluscs, masses of whelk eggs, spawn, magnificent scallops, grape-like bunches of cuttle-fish eggs, leathery nidamenta of rays and "dogs," huge oysters, which, though inferior in flavour to natives, are palatable enough to appetites sharpened by the sea-breeze. But nearly all these things are "rubbish" to the fishermen, though treasures to the naturalist; so overboard they go.

Let us glance at the fish. We see several skates, with their long prickly tails and squinting eyes—not bad food, however, when properly cooked, with cockle or egg-sauce, and held in estimation by college dons long ago, less popular now than their merits deserve; haddocks and soles; turbot thirty pounds weight and more; spotted dog-fish, plaice, flounders, and brill. Here, too, is a fish of which I have spoken to you before; beware of touching it, for the erect phalanx of dorsal spines bespeaks mischief. This is the great weever, the *noli me tangere* of the ocean beds, capable of inflicting a severe wound with its poisoned weapons. The "rubbish" is soon thrown overboard, and the men have plenty to do to sort the fish, and consign them to their respective compartments.

"Have you ever shot a puffin?" Willy asked. Yes, many years ago I shot two or three specimens, a guillemot and a razor-bill—birds that used to be very

common on the Ormeshead and on Puffin Island. I had them stuffed. The puffin is a very curious bird ; it is sometimes called the sea-parrot, as its bill bears some resemblance to a parrot. These birds are only summer visitors to our coasts, arriving in April and leaving about the end of August. Early in May puffins deposit a single large egg, sometimes in crevices and fissures on the perpendicular surfaces of the cliffs, at the depth of three or four feet from the front. Rabbit warrens are not unfrequent on our coast, and where this happens the puffins often contend with the rabbits for the possession of some of the burrows.

Many puffins, Mr. Selby observes, "resort to the Fern Islands, selecting such as are covered with a stratum of vegetable mould ; and here they dig their own burrows, from there not being any rabbits to dispossess upon the particular islets they frequent. They commence this operation about the first week in May, and the hole is generally excavated to the depth of three feet, often in a curving direction, and occasionally with two entrances. When engaged in digging, which is principally performed by the males, they are sometimes so intent upon their work as to admit of being taken by the hand, and the same may also be done during incubation. At this period I have frequently obtained specimens by thrusting my arm into the burrow, though at the risk of receiving a severe bite from the powerful and sharp-edged bill of the old bird. At the farther end of this hole the single egg is deposited, which in size nearly equals



PUFFIN AND YOUNG

that of a pullet. Its colour when first laid is white, sometimes spotted with pale cinereous,* but it soon becomes soiled and dirty from its immediate contact with the earth, no materials being collected for a nest at the end of a burrow. The young are hatched after a month's incubation, and are then covered with a long blackish down above, which gradually gives place to the feathered plumage; so that at the end of a month or five weeks they are able to quit the burrow, and follow their parents to the open sea. Soon after this time, or about the second week in August, the whole leave our coasts."

Willy wanted to know what these birds feed on, and whether they are good divers. Puffins feed on small fish and various crustacea. Mr. Yarrell states he has seen old birds, when they had a young one to feed, returning to the rocks with several small fish hanging by the head from the angle of the gape of the mouth. Puffins are capital divers. Mr. John Macgillivray says, "that at St. Kilda many puffins are taken when sitting on the rocks, by means of a noose of horse-hair attached to a slender rod of bamboocane. This mode is most successful in wet weather, as the puffins then sit best upon the rocks, allowing a person to approach within a few yards, and as many as three hundred may be taken in the course of one day by an expert bird-catcher."

Well, we have rested long enough, and must proceed on our walk. Now, May, gather some more plants. Here is the lesser meadow Rue (*Thalictrum*

* "Ash-coloured," from *cinis*, "ashes."

minus); look at the quantity of stamens, like little tufts of golden threads. What, May, you do not admire the odour? It is unpleasant, I grant. Here is the Bloody Crane'sbill (*Geraneum sanguineum*), with its bright purple flowers and deeply-cut leaves; and here in abundance is Lady's Fingers (*Anthyllis vulneraria*); the white calyxes are covered with woolly down, and in some places, on this account, the plant is called Lamb's Toes. The specific name of *vulneraria*, from the Latin word *vulnus*, "a wound," was given to it from its having been formerly used to staunch wounds. But we must now make the best of our way to Llandudno station, though I should much like to prolong our stay here in search of more wild flowers.

Happy, in my judgment,
The wandering herbalist, who, clear alike
From vain, and that worse evil, vexing thoughts,
Casts on these uncouth forms a slight regard
Of transitory interest, and peeps round
For some rare flow'ret of the hills, or plant
Of craggy fountain; what he hopes for wins,
Or learns, at least, that 'tis not to be won:
Then, keen and eager as a fine-nosed hound,
By soul-engrossing instinct driven along
Through wood or open field, the harmless man
Departs intent upon his onward quest!
No flow'ret blooms
Throughout the lofty range of these rough hills
Or in the woods, that could from him conceal
Its birthplace.

WALK VII.

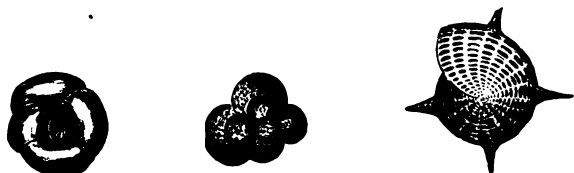
E will have another stroll on the shore to-day. But before we start, let us go into the town and see what the fishmonger has for sale. I want, too, to buy a sponge. Soles, salmon, kippered herrings, all which, I believe, are supplied from Rhyl, are on the slab; we will buy a bit of salmon for dinner, and a few kippered herrings for breakfast. And now for the druggist's shop for a sponge. This one will do well; do you see how full of sand it is? But, besides sand, sponges contain some very beautiful microscopic objects, called *Foraminifera*. They vary much in size, but all are minute. The name is derived from *foramen*, "a hole," and *fero*, "I carry," in



FORAMINIFERA.

allusion to the number of small holes with which many of the calcareous shells are pierced. What I see through my lens are merely empty cases. But once they were inhabited by little jelly-like creatures, of low organization, that lived in the sea. They possess a number

of long, thread-like processes, which may be seen issuing from the numerous apertures of the shell. These processes act as feet, and serve for locomotion. The shells are made chiefly of carbonate of lime, but the texture varies considerably. In some it is opaque, like porcelain, and in these there are no perforations; in others there are numerous little holes; in others again, the structure is transparent, like glass. Some forms remind one strongly of the nautilus, and formerly the creatures that dwelt inside them were considered to belong to the molluscous order, and to be related to the nautilus. It has, however, long ago been shown that the foraminifera are not at all like little molluscs, except in the external shape of some of



FORAMINIFERA.

the shells. But minute and unimportant as these foraminifera may appear to be, I must tell you that they have played a very important part in nature. "The geological chalk formations, which here and there rise in long chains of mountains, are due to agglomerations of animalcules with calcareous carapaces, and in spite of the size of their layers, are nevertheless composed of the *debris* of microscopic foraminifera. It is they that encircle England with the immense rampart of beautiful white, to which it

owes its ancient name of Albion. In Russia, near the Volga, in the north of France, in Denmark, Sweden, Greece, Sicily, Africa, and Arabia, many chalk hills have a similar origin." The stones of the Pyramids of Egypt are full of a species of foraminifera called *nummulite*, from its coin-like appearance,—*nummus* in Latin, you know, meaning "money." I have no doubt that the objects which Strabo, the Greek geographer, speaks of as having himself seen at the Pyramids, were some kinds of foraminifera. He says, "I saw one remarkable thing at the Pyramids, which I must not pass over without notice. In front of the pyramids lie heaps of stones from the quarries; among these are found pieces which in shape and size resemble lentils. Some contain substances like grains half peeled. It is said that these are the remnants of the workmen's food changed into stone, which is improbable."

I have some very pretty forms of these shells, which I will show you under the microscope when we get home. You will also admire the beautiful engravings in Dr. Williamson's and Dr. Carpenter's splendid books on the Foraminifera. Well has the first-named naturalist remarked—"Little to be envied is the man whose eye rests without interest upon forms so replete with elegance, as are many of these microscopic atoms. Grace and beauty meet him on every hand; whilst the objects in which these attributes are displayed often suggest associations little to be anticipated in creatures so minute. Miniature and fairy-like representatives of the classic nautilus present

themselves in rich abundance. The Attic Amphora and the Roman Lachrymatory are foreshadowed amongst the graceful Lagenæ; whilst some of the Cristellariæ might have been the prototypes of those ancient lamps that illuminated the hall of the Carthaginian queen, when

“Dependent lychni laqueraribus aureis,
Incensi, et noctem flammis funalia vincunt.”

Imagination may long revel amongst these lovely creations, ever finding abundant scope for the play of fancy; and should anyone still exist, in this nineteenth century, who is disposed to frown upon such objects as unworthy of serious study, let him submit to be reminded that in nature as well as in art,

“A thing of beauty is a joy for ever.”

Now for the shore again; the tide is going out fast. Willy, run to our lodgings and borrow a spade; I will dig for some lugworms. All right; here he comes with a strong useful spade. Now, do you see these little hollows in the sand, and the worm-casts near them? What quantities there are! They are made by the common lugworm (*Arenicola piscatorum*), so extensively used as bait by fishermen. I will dig one up; I dare say he is two feet deep in his sandy retreat. There! I have one perfectly uninjured. “Oh! papa,” said May, “it is a disgusting-looking thing.” Well, it is not very prepossessing, I allow, just at present, and see, as I handle it, it discharges a yellow fluid that stains the fingers. But I will put the worm into this tall bottle full of clear sea-water. There! what do you

think now of his appearance? "Oh! it is certainly not nearly so ugly now, and what are those beautiful red and purple tufts that beset each side of its body for more than half its length?" asked May. Those tufts are indeed beautiful; they are the creature's gills, or breathing organs; see how prettily formed they are, branching out like miniature trees.

The blood of the worm is constantly passing through the vessels in these tufts, where it is supplied with fresh air or oxygen, contained in the water. Let us look more closely at the lugworm. It is about ten inches long, with a contractile cylindrical body, thick and changeable in form for about half its length from the head, then suddenly narrowing; it is yellowish in colour, but in this respect specimens vary. There are about nineteen rings or segments; the gill-tufts are situated on the rings of the middle part of the body only; the mouth is provided with a short thick tubular proboscis; on each side of the body you will also notice several pairs of bristle-like feet. The worm bores its way through the sand by means of those bristle-like feet, which serve as a fulcrum. A kind of sticky fluid is secreted by the animal which cements the sides of the tunnel in the sand bored by the worm. Strange to say, the worm in making its excavation in the sand, repeatedly swallows large portions of it; the worm-casts—these little heaps of spiral rolls of sand so abundant here—are what the creature has swallowed and passed through its body. Willy asked whether the lugworm could reproduce lost portions of its body like the common earthworm. I have no knowledge,

my boy, on this point. There is no doubt that the common earthworm possesses the power, and if I remember rightly, a highly organized marine worm, the *Eunice sanguinea*, has been known to reproduce its amputated head. We were now close to the water's edge, and Willy espied about a couple of hundred yards off, swimming in the water, a bird, which with the aid of my binocular field-glass, I discovered to be the lesser black-backed gull (*Larus fuscus*), whose back is not, however, really black, but dark slate; the neck, breast, and tail are of a lovely pure white. Mr. Hewetson tells us these gulls are very bold in the defence of their eggs; he says, "whilst among them I was amused with one, near the nest of which I was sitting; it retired to a certain distance, to give it full force in its attack, and then made a stoop at my head, coming within two or three yards of me; this it continued to do incessantly, till I left it. It is also said that an old woman who was in the habit of gathering their eggs, had her bonnet almost torn to pieces—it being perforated through with their bills." The lesser black-backed gull was first observed as a British bird, breeding at Anglesey, by Pennant; it is pretty common in Wales, and no doubt breeds on the rocks and cliffs of the Ormeshead and Puffin island in company with other species of the gull family. "Is there not a kind of a gull that seldom or never fishes for itself, but pursues other gulls and makes them drop the fish they have caught?" asked Willy. Yes, the birds you mean, though they have the general appearance of gulls, are not true gulls, differing from them

both in form and habit. They are called by the strange name of Skua, from, as is supposed, the note of the bird which sounds like *skui*.

There are three or four British species ; but as they are for the most part inhabitants of northern regions, some are rarely seen. The toes of the skua are furnished with long curved claws, in which they hold their prey while tearing it in pieces ; the beak is also strong and hooked ; thus reminding us of the Falcon family amongst the non-swimming birds. Mr. Henry Shaw, of Shrewsbury, had some years ago a Pomerine skua, which had been killed by flying against the spire of St. Mary's Church in that town.

"But do they never take the trouble to fish for themselves?" asked Jack. I believe they rarely do so ; but I am only acquainted with their habits by reading of them ; I have no personal experience of them. Mr. Charles St. John speaks of the habits of the black-toed gull—the species called Richardson's Skua—in the following words : "While all the other gulls are busy searching for food, and satisfying their hunger, the black-toed gull sits quietly and, apparently, paying no attention to the busy flock. As soon, however, as a gull, however large, has picked up, and swallowed any large substance, the black-toed gull launches himself into the air, and pursues the bird on which he has fixed his eye. The latter screams, and wheels swiftly in every direction to escape his pursuer, but in vain ; every effort to avoid him is fruitless, and to escape further persecution, the gull brings up and ejects the coveted morsel, which the skua catches and swallows

before it reaches the sea or ground over which they are flying. In this manner the robber makes his living, apparently never hunting for himself, but compelling the other gulls to give up the fruits of their industry."

Ah! Jacko, what have you just picked up from the shore? "I do not know, papa; it looks like the tubular house of some kind of sea-worm." You are quite right; it is the empty case of *Terebella conchilega*. You see the tube is made of broken shell, sand, and gravel, and is about as thick as a quill. Both ends are open; at the upper end you notice some ten or dozen thread-like processes of sand; these have been formed by some of the worm's tentacles, which, secreting a sticky fluid, have cemented the grains of the sand together. "But where," asked Willy, "is the worm that once lived in the case?" He has probably hidden himself in the sand; or he may be dead, and his house to be let. The animals themselves are not very easy to obtain as perfect specimens; each lives nearly at the bottom of the tube, excepting when the inmate is feeding, or building. It retreats at the back-door with the greatest rapidity when it has reason to suppose any intruder meditates attack at the front. Still they are to be dug out. Give me the spade, Willy. There, by a sharp, rapid casting out of the sand by the spade, I have succeeded in getting a terebella. "Oh! papa, what a strange looking creature," said May; "what a quantity of long thread-like fleshy processes are entangled near the head." Yes; these are the worm's tentacles, and they serve as so many hands in building the house in which it

lives. "If a specimen be dislodged from its tube," Sir John Dalyell tells us, "it swims by violent contortions in the water, after the fashion of the Nereis, and some other worms or annelides. The tentacles and the branchiæ are compressed and contracted about the head like a brush, and as the animal very soon becomes exhausted by such unnatural exertions, it soon sinks to the bottom. Should a quantity of sand be now



TERRELLA CONCHILEGA.

scattered from above, the tentacula relaxing speedily extend to sweep the vessel clean, so that in the briefest interval, not a particle remains within their reach. The whole have been collected for employment in the construction of a new artificial dwelling for sheltering the naked body of the architect. Permanent exposure to the light, or to the air, is pernicious.

“The artifice, the selection of materials, and the expedition demonstrated by this creature are truly admirable; nor is it a small gratification to the curious, that all its qualities may be displayed before them. Should a tube be already constructed on the side of a glass vessel, wherein a specimen has had a permanent abode, the inhabitant is found lurking within in the earlier part of the day, only the extremities of the tentacula protrude beyond the orifice, and so they remain till towards noon. But scarcely has the sun passed the meridian, when the animal begins to be restless. Between four and five, the animal has risen upwards, the tentacula extending with the approach of evening, and after sunset, they are in the greatest activity. They are now let down from the orifice like so many slender cords, each seizes on one or more grains of sand, and drags up its burden to the top, there to be employed at the summit of the tube, according to whatever service is requisite. Should any of the lading slip its hold, the same organs search eagerly after it at the bottom, to be seized and raised up to the top anew. Such operations are protracted during several hours, though without any visible additions to the tube. Nevertheless, on resuming inspection next morning, a surprising prolongation will be discovered; or instead of an accession of the same description, the orifice is sometimes surrounded by forking threads of sandy particles agglutinated together.

“The architect has now retired to repose; but, as evening comes, its activity is renewed, and against

sunrise a further prolongation has augmented its dwelling. All these are nocturnal labours. Such, indeed, are the habits common to the tenants of the deep, whose faculties are most energetic, and their industry most active, while the upper world are buried in sleep." Sir J. G. Dalyell tells us further that this quick and clever little workman never resumes a possession of a tube it has once forsaken. When it wants a new house, it begins to build again from the very foundation.



WALK VIII.

THE wind was very high last night, and the waves are still tossing themselves, and showing their white crests. What a magnificent sight is the mighty ocean, whether in calm or stormy weather ! how well has the poet sung of that—

Glorious mirror, where the Almighty form
Glasses itself in tempests ; in all time
Calm or convulsed—in breeze, or gale, or storm,
Icing the pole, or in the torrid clime,
Dark heaving ; boundless, endless, and sublime.

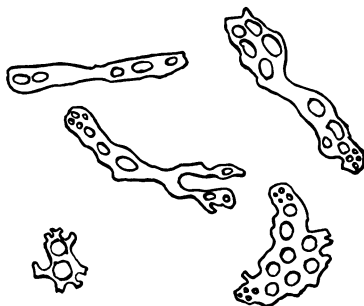
We will stroll again on the shore, we are sure to find something washed up after the storm. What have we here ? An oblong fleshy mass, slightly taper-



SEA CUCUMBER.

ing to each end, about three inches long ; but when the animal is in the water it can extend itself consider-

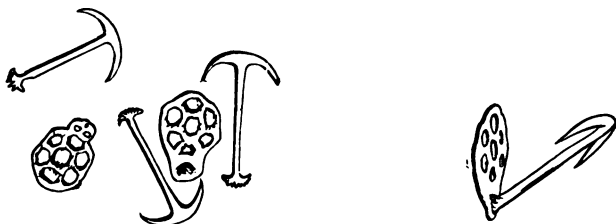
ably more. It is one of the sea cucumbers (*Holothuriadæ*); the form of the body when in a contracted state reminds one strongly of the vegetable of that name. They are also sometimes called "sea-puddings." Their bodies are furnished with numerous suckers, similar in form to those of the sea-urchins and starfishes, variously arranged according to the genera. The animal has a circle of tentacles; at present this circle



CALCAREOUS PLATES OF SEA CUCUMBER.

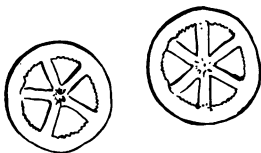
is concealed within the mouth. The skin is very tough; like the skin of the common starfish, it contains numerous scattered calcareous spicules. If I were to snip off a thin bit of the sea-cucumber's skin and dissolve it in potash, and then wash the sediment carefully in pure water, and examine it under the microscope, I should see that what, to the naked eye looks like fine dust, is made up of numberless spicules of remarkable elegance of form. A closely related member of the same family of *Holothuriadæ*, the *Synapta inhærens* of the Mediterranean seas—not found

I believe on our coasts—has imbedded in its skin minute spicules of a very striking and beautiful form. Each spicule consists of an oblong calcareous plate, regularly perforated by large holes; at one end there is a projection to which is attached another spicule, which bears a remarkable likeness to the anchor of a



ANCHOR AND PLATES OF SYNAPTA.

ship. Another Holothurian (*Chirodota violacea*), also found in the Mediterranean sea, possesses spicules exactly resembling the wheels of a carriage—all these



WHEEL-LIKE PLATES OF CHIRODOTA VIOLACEA.

are very beautiful objects; and I have mounted specimens at home which some day I will show you under the microscope. I have often spoken to you of certain animals which have the power of reproducing lost parts, perhaps the members of the sea-cucumber family possess this faculty in a more remarkable degree than

any other known animal. They can part with the entire insides of their bodies, and be none the worse for this rejection of the "inner man;" on the contrary, having got rid of such troublesome trifles as their old insides, they are quite ready to begin the world again with a new set! a physiological feat much to be coveted by all dyspeptic patients amongst mankind! The "trepang," of which you may have heard, and which is used extensively in China and other parts of the East as an article of food, is a member of this family; it is called the *Holothuria edulis*. Your Uncle Robert, when with his regiment in China, a few years ago, frequently ate of trepang soup, or sea-slug porridge, and considered the dish by no means a bad one.

"Oh, papa," exclaimed Willy, "what have I found now?—a lot of hard, twisted, shelly tubes attached to an old oyster-shell. Are they the houses of some kind of marine worm?" Yes; and a most beautiful and interesting worm, too. Let me see whether the animals are at home, and open to receive visitors; to be sure they are. I can tell by the stoppers closing the doors. Let us sit down on this large stone, and place the twisting tubes in this small pool left by the tide. By and by, I dare say some of the worms will pop out their heads. "There goes another cormorant," exclaimed May; "they seem to be common on this coast." They are; I forgot to tell you, by the by, when we talked about those birds on our walk the other day, that cormorants have been trained to catch fish in this country as well as in China. James I. introduced cormorant-fishing into this

country from China ; “ he built an extensive establishment for cormerants about the spot where the new Houses of Parliament have been erected ; and here he had ponds made, and stored with suitable fish, and filled with water from the Thames by means of sluices. A person of the name of John Wood seems to have been the first Master of the Royal Cormorants, which, like the Master of the Horse, and the Master of the Royal Buckhounds, was an office of importance.” The king was very jealous of all interlopers ; none were allowed to interfere with, or even to gaze upon his feathered favourites at “ the keeper’s most extremest peril.” The Secretary of State Conway, we are told, was obliged by the king to act as head cormorant-keeper himself. One of the king’s much-prized birds having been lost, and it being suspected that Sir Francis Wortley, Lord Conway’s cousin, had the bird in his possession, the Secretary of State writes a sharp letter to his cousin, to restore the bird at once. The bird had by some means come into Sir F. Wortley’s possession, and accordingly he restored it. Wood, the Master of the Royal Cormorants, received eighty-four pounds per annum, with half-a-crown daily fee for going to the Isle of Man, and other northern localities, in search of haggard and nestling cormorants.

Cormorant-fishing has been quite recently introduced into England by Captain Salvin, who has given an extremely interesting account of the daily management of the birds, the apparatus used with them, the proper dress for the fishermen, the tempers and

peculiarities of his tame birds, etc., etc., whose names were Hobble-gobble, Kas-wang, the Pick-pocket, the Detective, and the Artful Dodger. The following animated description of a day's cormorant fishing is from the pen of the same sportsman:—

“I will suppose that the spring-cart is ready, and that you are in fishing costume. Catch the birds, strap them, and put each into its chamber upon a little straw, and putting them into your conveyance with some wet grass over the top in very hot weather to keep them cool, put also into the cart a fishing-creel, a lure on a string, a short whip that will crack well, and a sponge to keep all clean, and drive off to the stream you are to fish. Now, pull up at a likely bend in the brook, and turn out a couple of birds, reserving one to be put in a little later when the others require rest; stir up their tardy movements by a good crack of your whip, accompanied by a little hunting language as—‘Get away, haw!’ and now and then throwing a little light soil, as a handful of a mole-hill, at them. They are both on the surface, where they cannot catch fish; but now give another crack, and rate them again, when they will take headers, and the water being clear, you will see them hunting and prying about into all the likely places. Now there’s a splendid course; two or three sharp doubles, and up comes ‘Kas-wang’ with a big chub, which, though it struggles fearfully, is eventually ‘pouched,’ all but the tail, which sticks out of the bird’s mouth. The line is of no use in this case, for there is clearly no room for it, and as the cormorant,

finding his load very inconvenient and unpleasant, is not long before he lands with it; going up very quietly, you put your hand slowly above his head, just when he is trying to swallow, and taking him by the bill, you bring him upon the grass and then disgorge him. Whilst this is going on, a loud shout and roars of laughter proclaim that the 'Detective' has caught an eel, which is giving him much trouble, for the slippery thief is constantly getting away, and has to be recaptured; though no reward has been promised at least this bird—a famous one at eels—sees his opportunity and takes it. There is a nice open sloping bank; and tossing and playing as it were with the eel, he bolts up the bank with him to worry him on land. This old dodge of his is certain death; and the master, in his excitement, cries 'Whoo-up!' which makes all ring again. Eels often get away from cormorants, especially where the banks are steep, but where they slope none escape the 'Detective,' though they may try every means to get off, not forgetting to twist round his neck, with the hopes of garroting him. These birds are so fond of eels that where they abound they will take no other fish; and I have known this to be a great nuisance when your object has been to take trout. Eels, again, soon tire them, on account of the hard work it is to take them.

"It is a pretty sight to see cormorants throw a small fish into the air, which they often do, when they catch it by the tail or thereabouts, and then re-take it by the head as it descends; for all fish must go down head first, on account of their fins lying back from

head to tail, and consequently being uncomfortable when reversed.”*

Now let us look at *Serpula contortuplicata*, for that is the very long name of this pretty worm. There!



SERPULA CONTORTUPLICATA.

you see three or four heads out of the cases ; are they not lovely ? Look at their scarlet fins, beautiful as coral, and the trumpet-shaped stoppers of the same brilliant colour. The scarlet fins are the creature's branchiæ or gills ; they form two corresponding erect fan-shaped tufts ; there are two tentacles between the gills, the trumpet-shaped stopper being one of them, this is spread out into an *operculum*, or stopper, where-with the worm closes the mouth of the tube. I touch one of these protruded coral heads. There ! quick as thought, it has vanished ; and now the other heads have also retreated. They are timid, nervous, little creatures ; but Mr. Shirley Hibberd, an excellent

* “ Land and Water Journal,” July 29, 1867.

authority, tells us that "whatever may be said about taming creatures which seem so destitute of intelligence as sea-worms, the serpulæ certainly change their habits somewhat in confinement, and instead of withdrawing on the slightest alarm, even of a footfall, or the passing of a shadow over the vessel, get at last quite bold, and remain expanded in spite of small disturbances. At first it is quite impossible to examine them minutely, owing to their timidity, but after a while, they will give the student every opportunity for applying a lens, and there are few subjects more worthy of a close scrutiny."* The serpulæ will certainly occasionally throw off their stoppers, and continue to live for some time afterwards, as I have witnessed myself; whether the animal has the power of reproducing them, is not, I believe, known. Ha! what is this funny fellow scuttling away as fast as his legs can carry him, as if conscious he is a rogue and does not want to be "taken up." "Look at him, papa," said Jack, "I cannot make out this creature at all; he looks to be partly a crab and partly a mollusc." It is the Hermit or Soldier crab, that has taken possession of a whelk's shell; no wonder the rogue ran away from us, Jacko! How sly he looks too! Do you think he has only taken possession of a house, "apartments to let," a tenant being wanted; or has he murderously destroyed the real owner of the shell, in order to take possession? I am inclined to think Mr. Hermit Crab is not, as a rule, guilty of murder, but that being in want of a house, and having fortunately found one empty, he did not care to consider the justice of the old proverb,

* "*Marine Aquarium*," p. 115.

“an empty house is better than a bad tenant,” and conceived he was in no way guilty of burglary in taking possession thereof. “But why?” asked Willy, “does the Soldier crab want the house of another animal in which to live. Crabs generally do not require houses.” Quite true, but the hinder parts of the Hermit crabs are quite soft and need protection; and it is most amusing to see the Hermits when deprived of their homes, seeking for fresh ones—first trying one and then another, to see whether or not it is comfortable, and readily portable. They have received the name of Soldiers from their pugnacious dispositions. I have often witnessed combats between them, and sometimes seen one fellow forcibly drag his enemy out of his house, and quietly ensconce himself therein. Mr. J. A. Salter says, “I have many times found Hermit crabs out of their shells in the mingled mass of a dredge haul, and on three occasions have watched the method in which the houseless creature domiciliates himself. These were the only occasions on which I endeavoured to observe the operation; they always seem willing enough to exhibit their housing performance. My plan of observation was simply this—I put a naked crab into a large glass jar of sea water, with one shell, the latter of size about proportioned to the former; and then I contemplate. In each case the crab proceeded in the same way.

Appearing to *see* the shell in the distance, the animal crawled up to it for the purpose of seeing if the house were to let; and this circumstance he discovered not by sight but by *touch*. Upon reaching the shell

he hooked two of his legs into its open mouth, and thrusting them as far down into its cavity as possible, commenced scrambling round the edge; he was evidently probing to discover if there was already an inhabitant. In each case the crab pursued this probing operation in the same direction, commencing on the projecting side of the shell, and ending on the receding side. Having performed this process once round, he instantly, in the twinkling of an eye, erected straight his tail, and whisked himself *over the smooth lip of the shell* into its tube with a rapid adroitness that was perfectly marvellous. And then in his new contrasted position he looked so funny—such *at homeliness* there was in it; he was so different from the poor houseless vagabond with a drivelling tail, that one had seen miserably crawling about a moment before; he looked right up in your face and said, as plainly as looks can speak, ‘How d’ye do? here I am, quite at home already.’ I never saw it without laughing.”

There are several British species of these Soldier crabs, all of which inhabit the shells of molluscs. The belly part is always soft and provided with a pair of unsymmetrical appendages, by means of which the crab drags about his home. But it is time to return to our home.



SHELDRAKE AND YOUNG.



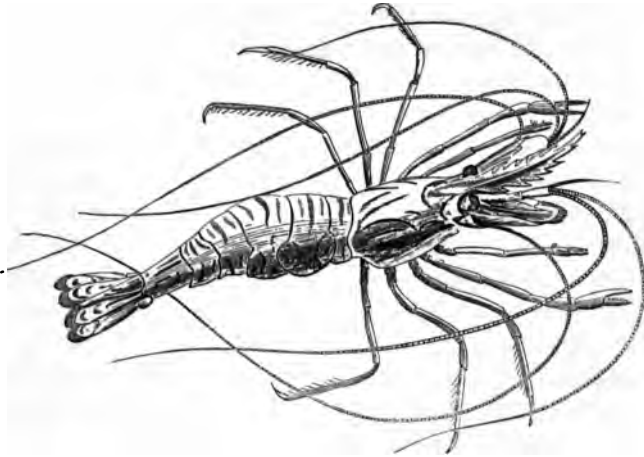
WALK IX.

TO-DAY we will take the train as far as Colwyn, and revisit the rocky shore near the Weir Fishery. The tide will suit us capitally, and there is a nice breeze from the sea; so we shall not feel the heat. "What is that large house about half a mile above Colwyn Station, prettily situated in the midst of trees?" Willy asked. It is Pwllcrochan Hotel, and a most charming spot it is; there is a beautiful view of the sea from it, as you may suppose. It was formerly the residence of Lady Erskine. I should like to hunt those woods, Willy, in the autumn for funguses. I suspect we should find some we have never seen before. We must try and get a holiday in the autumn some time or other. I dare say we could get leave from Mrs. Lloyd Wynne, of Coed Coch, to ramble about the woods there, which I believe abound in various kinds of funguses. Well; we are soon out of the train, and on the shore. May soon calls my attention to some birds which she saw on the shore some way off. With the aid of my field-glass, I discovered that they were shelldrakes. Very beautiful birds they are, with their red bills, bodies white and

chestnut, head and neck bright glossy green, and pink feet and toes. When as a boy I lived near Parkgate, I used to get some of the young ones which were caught on the sands, and very pretty little things young shelldrakes are. I believe these ducks lay their eggs in deserted rabbit burrows, or in holes in the sand. In some places they are called Burrow Ducks. Whilst the duck is sitting, the drake watches near; and when his mate wants to leave the nest for food he takes his turn upon the eggs. It is said that where the nest is some way from the water, the young are sometimes carried thither in their parents' bills. Their food consists almost entirely of shell-fish, especially cockles, which, Mr. St. John informs us, this bird extracts from the sand by paddling or stamping with both its feet. This brings the cockle quickly to the surface. He also mentions that tame birds often do the same in the poultry-yard if impatient for their food, which when in confinement should be grain, soaked bread, etc. Though the shelldrake is so beautiful a bird, its flesh is coarse and unpleasant, both in flavour and smell. They are very ornamental as water-fowl in gentlemen's parks, but are said to be somewhat quarrelsome with other birds.

"Oh! papa, I do think I have caught a prawn in my net," cried Jack. So it is, though a small one. Where did you find him? "I found him in this little rock pool," said Jack; "perhaps there may be some more there." To be sure; there goes one flitting like a shadow, so transparent is the fairy form of an active living prawn. "I thought," said May, "that

prawns were red; these creatures are almost colourless." They turn red when boiled, but in a living state they are as you see them here. It is not easy to study their habits in their native haunts, for they soon seek the shelter of the sea-weeds and cracks in the rocks; but I have occasionally kept them in an aquarium, and most interesting it is to see their move-



COMMON PRAWN.

ments. "When in full swimming action," says Professor Rymer Jones, "the appearance of these beautifully transparent crustaceans is most elegant. The front feet are generally laid backward and tucked under the body, like the fore legs of the deer tribe in the act of leaping. The long and delicate antennæ stream gracefully on each side of its body, and float

for some distance beyond its entire length; while its strong abdominal paddles propel it rapidly through the water."

A prawn possesses a pair of forceps in the feet, which it uses as hands in a very clever and amusing way; the food is seized by these organs, and conveyed to the mouth. Professor R. Jones also remarks that it is a striking and curious thing to observe these creatures, by the aid of a lighted candle or lamp, in a dark room during the night, in consequence of the bright reflection of the luminous body from their prominent stalked eyes; for as the prawn does not retain a stationary position, but slowly roams about through the water and over the rockwork, seeking for its food, it adds an increased interest to its appearance to behold these small globes of bright light, like the bull's-eye signal-lamps of a miniature railway-engine looming through the distance in a dark night, moving slowly along, the body of the creature being quite imperceptible, and nothing visible but these pairs of globular balls of fire shining from out the dark water.

Prawns, like shrimps, carry their eggs in clusters under their fins. The young undergo metamorphosis; and as they grow, throw off their external covering periodically. The prominent horn or *rostrum*, as it is called, is, you see, very sharp and armed with seven or eight pointed teeth, hence the Latin name of *serratus*, from *serra*, "a saw." "How are prawns caught, papa?" asked May. Prawns are caught in great numbers with the shrimp net, and also in wicker-work pots. I believe prawns are not common except on the south coast;

unlike shrimps which prefer a sandy shore, prawns prefer a rocky coast. I remember when at Lulworth,



PRAWN-TRAP.

many years ago, eating some of the largest, most juicy and delicious prawns I had ever seen. As much as eighteen shillings a hundred has been paid in London for these crustacea.

"Here is a bit of old wood with several round holes bored through it, what do you think, papa" said Jack, "has made these holes?" The holes you see are nearly half an inch in diameter, and, as a rule, always in the direction of the grain; so I have no doubt they have been made by one of the most destructive creatures in existence, namely "the ship-worm." It is wrongly, however, called a worm for it is a mollusc. Its Latin name is *Teredo navalis*. The animal is elongated and worm-like; the shell thick, short and globular. The animal is generally about a foot long, but sometimes grows to a much larger size. It bores into ships, piles, and piers. In 1732, "the Dutch were greatly alarmed by an apprehension of being overwhelmed by an inundation occasioned by worms, which were said to have consumed the piles of timber-work that supported their dykes. They prayed and fasted with uncommon zeal in terror of this calamity, which they did not know how to avert in any other manner. At length they were

delivered from their fears by a hard frost, which effectually destroyed their dangerous enemies." Copper sheathing is a protection against the ravages of these creatures. It is very curious to observe that though these "ship-worms" often work in companies, they never interfere with each other nor cross each other's path. Occasionally, when a hard knot occurs in the wood, the animal bores across the grain to avoid it, but its usual course is with the grain. By what means the creatures makes these holes has, I believe, never yet been determined. "What are all these sharp shell-like things completely covering large portions of this large stone?" said May. They are Cirripedes, or Sea-acorn shells. The tide being out at present, the valves of the shell, which in this genus (*Balanus*) are six in number, are closed; when the returning tide covers the stone, thousands of these little animals will open their valves and thrust out their delicate hands in search of food, which are thus brought to their mouths. Here is a small lot of acorn barnacles on this stone, not larger than my fist. I will place the stone in this hole in the rock which is full of water, and I dare say the little creatures will soon open their valves. You notice at first a narrow slit which soon widens to an oval, and now you observe a feathery hand, consisting of delicate curled threads, is shot quickly forth, opening out and uncurling to the form of a fan; then, quick as thought, the tips of the threads curl up once more, and the whole net is quickly withdrawn and disappears beneath the closing valves; soon, however, they open again and the process is

continually repeated. As the acorn barnacle is fixed at the basal end to the stone, he is unable to make excursions in search of food; so he is content to remain at home and to throw his casting net from his castle door for any microscopic creatures that the water may bring near him. In their young state, however, the barnacles move freely about. In this stage the young barnacles are very unlike their parents, reminding one of some of the water-fleas, (*Cyclops*) of our ditches and ponds. Very wonderful are the metamorphoses through which many animals pass, and those of the acorn barnacles are perhaps amongst the most striking.

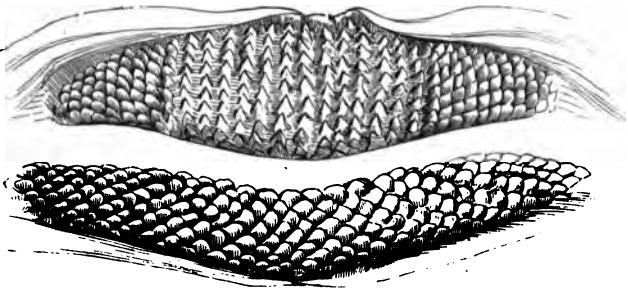
Some foreign species of barnacles, as the *Balanus psittaceus*, of the coast of Chili, grow to the size of five or six inches. Under the name of *pico*, the inhabitants eat this species, which is said to be as rich and delicate as the flesh of the crab. "But, papa," said Willy, "are those the barnacles that were once supposed to turn into geese, as I have somewhere read in some of your books!" No, the species you mean is the *Lepas anatifera*; the latter Latin word signifying "goose-bearing." The animals belonging to this genus have a long, flexible, hollow muscular peduncle, or foot-stalk, by which they attach themselves to submarine bodies, posts of wood, ships'-bottoms, etc. "Oh, papa," said Jack, "do you really mean to say people were so foolish as to believe that shell-fish could ever turn into geese? what simpletons they must have been!" Some people, my boy, who never care to think and examine for themselves, will believe anything. It

is a fact, however, that even men of eminence have believed in the idea that barnacles produced geese. This is what old Gerrarde, writing in the sixteenth century, says :—

“ But what our eyes have seen, and our hands have touched, we shall declare. There is a small island in Lancashire, called the ‘ Pile of Foulder’s,’ wherein are found the broken pieces of old and bruised ships, some whereof have been cast thither by shipwracke, and also the trunks and bodies, with the branches, of old and rotten trees cast up there likewise, whereon is found a certain spume or froth that, in time, breedeth into certain shels, in shape, like those of the muscle, but sharper pointed, and of a whitish colour, wherein is contained a thing in form like a piece of silke finely woven as it were together, of a whitish colour, one end whereof is fastened unto the inside of the shell, even as the fish of oysters and muskles are ; the other end is made fast unto the belly of a rude masse or lump, which in time commeth to the shape and form of a bird. When it is perfectly formed, the shell gapeth open, and the first thing that appeareth is the foresaid lace or string ; next cometh the legs of the bird hanging out, and as it groweth greater, it openeth the shell by degrees, till at length it is all come forth, and hangeth onely by the bill ; in short space after it commeth to full maturitie, and falleth into the sea, where it gathereth feathers, and groweth to a fowle bigger than a mallard and lesser than a goose, having blacke legs, and bill or beake, and feathers blacke and white, spotted in such a manner

as our magpie, called in some places a *Pie-an-net*, which the people of Lancashire call by no other name than a tree-goose, which place aforesaid, and all those parts adjoining, do so much abound therewith, that one of the best is bought for three pence. For the truth hereof, if any doubt, may it please them to repair unto me, and I shall satisfie them by the testimonie of good witnesses."

"Oh, papa," exclaimed Jack, "here is part of a dead fish lying on the shore; it must have been a



JAWS OF THORNBACK RAY.

queer creature with its long tail." It is one of the skate fishes evidently, belonging to the *Raiidæ*, or Ray family. See, here are its teeth. "Are those blunt knobs its teeth?" asked Willy. "I thought that the skate-fishes, like sharks, to which you once told me they were related, had sharp teeth like them. The teeth of I believe nearly all the skates are flat and pavement like, as you see in this specimen I hold in my hand. The young are inclosed in a horny case,

square in shape, with four projecting horns, exactly resembling a butcher's tray, so commonly seen in large towns. They are like the shark's egg we picked up the other day; but the four projections are short and without tendrils. These fish, like the sharks, have five gill-openings, but they are placed on the underside. The teeth are evidently well fitted to crush the crustacea and molluscs on which they principally feed. There are a great many species of skates, and some are used as food. The tails of several are armed with sharp spines, capable of inflicting a severe wound. The sting-ray, or fire-flaire (*Trygon pastinaca*), not unfrequently taken on the southern coast, has a most formidable weapon on its tail—a long, sharp, saw-like spine, which it uses with great effect; it is not venomous, however, as the ancients supposed. Mr. Couch says that the skate is never the special object of the fisherman's search; and when it chances to take the hook, it may give him perhaps a greater amount of trouble than the prize can repay. As if sensible of danger, it will lie as still as if the line had got entangled with a rock, in which case the only resource is patience; for an attempt to raise it from the ground will only have the effect of causing it to remain more still. If, however, the head be raised, the body will follow, and the fish ascends like a kite into the air; the effort of the fisherman being directed to gather in his line in such a manner that the fish shall not be able again to turn its head downwards, which, if it did, no strength he could employ would interrupt its descent. Willoughby tells us of

one of these fish, weighing two hundred pounds, being served on the table at St. John's College, Cambridge, and one hundred and twenty dons partaking thereof. I think skate and cockle sauce very good food myself, but many people will not touch it. The Liverpool markets are well supplied with skate, which is sold at a cheap rate to the poor. We must return to Colwyn for the train.



WALK X.



WHILST strolling in Pensarn this morning, we saw flitting about in a shop window one of those beautiful insects, called Humming-bird hawk-moths ; the people in the shop kindly allowed me to capture it, and it is now in May's collection of insects. The name hawk-moth is applied to several other moths, as the Privet hawk-moth, the Death's-head hawk-moth, etc. They are all remarkable for the strength and peculiarity of their hawk-like flight, and often for their large size. The Humming-bird hawk-moth is at once distinguished by its rapid flight, every now and then gracefully poising itself on its wings, which vibrate with immense rapidity ; so similar in this respect are the gestures of birds and insects, that the moth has often been mistaken for a humming-bird. It may be seen occasionally in gardens, poising itself before the petals of some flower into which it inserts its long tongue for the nectar contained therein. It appeared in great numbers in several counties in England, Ireland and Scotland, in the year 1865. The caterpillar of this moth is green, yellow and white, arranged in stripes ; it feeds on the bed straw and other *galiums*. The tail of the moth is spread out

into tufts, which give it a bird-like form. It is a most attractive insect, and I dare say you will some time have an opportunity of seeing it in the garden at Preston.

We will now be off again to the shore. "Oh, papa, what are these little hopping creatures that occur in great numbers under bits of dried sea-weed? Hah! hah! how funnily they jump." They are sand-hoppers, (*Talitrus locusta*) Jacko, and very clever jumpers they are; they do not, however, use their legs to raise them aloft, but their tails; this organ is very short and folded beneath the body; it is, however, worked by very strong muscles, and when struck forcibly out, enables the creature to spring to a considerable distance. The French call it "Puce de mer." The Latin name *Talitrus* or *Talitrum*, means a "fillip," and appropriately describes the jumping properties of this little crustacean. It is to this species, doubtless, that Archdeacon Paley alludes, under the name of *shrimps*. "Walking by the sea-side, in a calm evening, upon a sandy shore, and with an ebbing tide, I have frequently remarked the appearance of a dark cloud, or rather very thick mist, hanging over the edge of the water, to the height, perhaps, of half a yard, and of the breadth of two or three yards, stretching along the coast as far as the eye could reach, and always returning with the water. When the cloud came to be examined, it proved to be nothing than so much space filled with young *shrimps* in the act of bounding into the air from the shallow margin of the water, upon the wet sand. If any motion of a mute

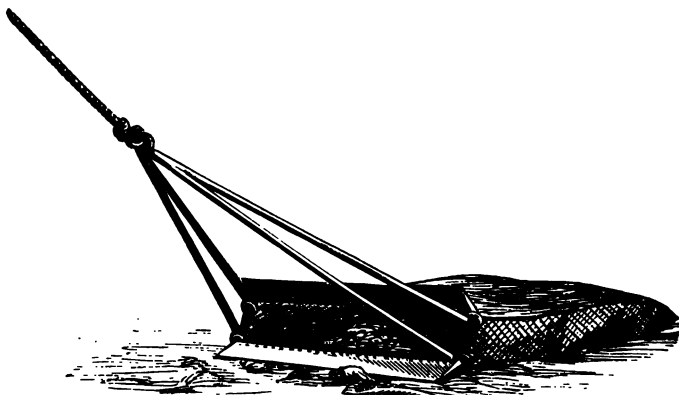
animal could express delight, it was this ; if they had meant to make signs of their happiness, they could not have done it more intelligibly. Suppose, then, what I have no doubt of, each individual of this number to be in a state of positive enjoyment, what a sum, collectively, of a gratification and pleasure we have here before our view." Catch one of the little fellows, Willy, and close your hand upon it ; do you notice how he tries to get out between your fingers, and feel what strength he has ? "The sand-hoppers are never found in the water, but dwell beneath the decaying sea-weed or other stray substances which preclude the evaporation of moisture from the scorched sandy-beach." Mr. Gosse tells us that he has found them at the depth of several inches in half-rotten beds of algæ, where the fermentation has induced a heat so great that he could scarcely bear his hand. "What do they eat, papa?" said Jack. They are not at all particular nor dainty in this respect, Jacko ; almost any dead or decaying animal is readily attacked by them. Professor Westwood and Mr. Spence Bate say they have seen them enjoy their repast upon a common earth-worm ; and that drowned puppies and other mammals afford a luxury to thousands, and when they can get nothing else they are content to feed upon each other. "Upon the sands of Whitsand Bay," the same writers continue, "our friend, Mr. Swain, informs us that one day at a pic-nic party, he saw not millions, but cart-loads of this species lying piled together along the margin of the sea. They hopped and leaped about, devouring each other as if

from very wantonness. A handkerchief, which a lady let fall amongst them, was soon reduced to a piece of open work by the jaws of these creatures." They form agreeable food to the ring-plover, and other shore birds; there are also two species of beetles that have been observed to prey upon them. "Come away, papa," said May, "or perhaps the nasty things will want to prey upon us; if they would eat a lady's handkerchief, they might not object to my dress. I don't like the sand-hoppers."

Here is one of the Star-fish, or Five-fingers (*Uraster rubens*), as the fishermen call them; you see it is alive, and is moving about its numerous sucker-like feet. The star-fishes belong to the class *Echinodermata*, a word which, signifying "hedgehog skinned," appropriately expresses the character that is most conspicuous in these animals. "I do not see any long sharp prickles upon this star-fish," said Willy, "and do not think the name is very suitable." Perhaps not; but in some of the animals of this class the prickles are very conspicuous, as in all the species of the sea-urchin order. Now, it can be shown that there is a manifest relationship between star-fish, sea-urchins, and sea-cucumbers, and by what beautiful and instructive gradations the orders pass one into the other, will, I hope, some day afford you most interesting and instructive matter for contemplation. See how the creature moves its suckers, like so many tiny worms. These, in the star-fishes, sea-urchins, and sea-cucumbers, are the organs of motion. It is a most interesting sight to see a star-fish or sea-urchin

walk up a glass vessel. We see a number of these worm-like suckers appear, waving to and fro; these, coming in contact with the glass vessel, adhere to it, and drag the creature along by muscular action.

There are several kinds of star-fish, found on the British Coasts. There is the Sun-star, the Bird's-foot, the Eyed-cribella, the highly-interesting Feather-star, the Brittle-star, the Sand-star, all of which I



DREDGE IN ACTION.

have, from time to time, met with when I have been out dredging. "But tell us," said Jacko, "something more about the common Five-fingers, which we can examine ourselves, and find whenever we go to look for them. I wish, however, you would take us out in a boat some day; it would be such fun to dredge up a number of curious animals from the sea-bottom." Well, we may have an opportunity some day; and when you get older you will, I hope, have more know-

So, we have a \mathbb{Q} -linear map $\varphi: \mathbb{Q}[x] \rightarrow \mathbb{Q}[x]$ defined by

$\varphi(f(x)) = f(x) + f'(x)$ for all $f(x) \in \mathbb{Q}[x]$.
We have $\varphi(1) = 1 + 0 = 1$.

So, φ is a \mathbb{Q} -linear map from $\mathbb{Q}[x]$ to $\mathbb{Q}[x]$ such that $\varphi(1) = 1$.

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ledge of natural history, and be better able to understand what you examine. The common Five-fingers is a great enemy to oysters, and fishermen have a deeply-rooted aversion to them and all their relatives. Not only when fishing with the line does the star-fish annoy them by taking the bait time after time, but they will come in mighty shoals upon oyster-beds, and devour the dainty meat. "How," said Willy, "can a star-fish open the shells of an oyster? I have seen you take a long time sometimes, even with the help of an oyster-knife." The ancients supposed that the star-fish watched when the oyster opened its shell; it then stuck one of his fingers in, and caused the oyster to open wide his folding-doors.

The prickly *star* creeps on with like deceit,
To force the oyster from his close retreat.
When gaping lids their widen'd void display,
The watching *star* thrusts in a pointed ray,
Of all its treasure spoils the rifled case,
And empty shells the sandy hillocks grace.

"Dear me, how funny!" "But, papa," said May, "why did not the oyster close his valves, and squeeze Mr. Star-fish's finger for him? Oysters do sometimes close their shells on creatures, and catch them—do they not?" Yes; Mr. Frank Buckland gives us the story of a rail being caught in this way by an oyster. "Some time ago," he says, "when examining the famous oyster-beds at Helston, near Falmouth, Mr. Hill mentioned to me that he had a curious specimen of a bird that had been caught by an oyster. The bird and oyster had been mounted in a case by Mr. Vingar, of

Penzance. I have received from Mr. Hill a photograph of the above event, which I have since had engraved. The history is that a woman who sells oysters went one morning to the Helford river, and found the bird—a common rail—quite dead, with its beak held firmly by the oyster, which was still alive. The bird, in all probability, was wandering along the foreshore looking for his dinner, and Mr. Oyster—possibly left longer by the tide than usual—was opening his shells, waiting the incoming water. The hungry rail, seeing something that looked like a white and dainty bit of food, pecked at the body of the oyster, and probably pricked him sharply with his beak. The oyster then snapped his shells together as quick as a rat-trap, and the poor bird instantly became a prisoner, to die (or possibly get drowned as the tide rose) in his prison.”*

“But how,” asked Willy again, “can a star-fish destroy an oyster?” It has long been a question amongst naturalists how so comparatively powerless a creature as a star-fish can destroy an oyster, which he certainly cannot swallow. Small crustacea and worms, the star-fish can have no difficulty in devouring whole; but how does he get at the dainty morsel so firmly locked in the ostrean larder? I only know what is said on this subject, I have no personal knowledge of it. Its mode of proceeding is said to be as follows:—“Grasping its shell-clad prey between its rays, and firmly fixing it by means of its prehensile suckers, it proceeds deliberately to turn its stomach

* “Land and Water” for April, 1870.

inside out, embracing in its ample folds the helpless bivalve, and perhaps at the same time instilling some torpifying fluid, for the shells of the poor victim seized soon open, and it then becomes an easy prey." Whatever may be the true explanation of the mode, there is no doubt of the fact that oysters are destroyed by these destructive Five-fingers.

Many kinds of star-fish throw off their limbs, and it is not uncommon to meet with a "four fingers" or a "three fingers:" in one species known as *Luidia fragilis*, it is almost impossible to obtain perfect specimens, on account of their suicidal habits. The late Professor Edward Forbes, had often failed to procure a good specimen, so one day he took with him in his boat a bucket of fresh water, in order to kill instantaneously any specimens the dredge might bring up. "As I expected," he says, "a *Luidia* came, a gorgeous specimen. As it does not generally break up before it is raised above the surface of the sea, cautiously and anxiously I sunk my bucket to a level with the dredge's mouth, and proceeded in the most gentle manner to introduce *Luidia* to the purer element. Whether the cold element was too much for him, or the sight of the bucket too terrific, I know not, but in a moment he proceeded to dissolve his corporation, and at every mesh of the dredge his fragments were seen escaping. In despair, I grasped the largest, and brought up the extremity of an arm with its terminating eye, the spinous eyelid of which opened and closed with something exceedingly like a wink of derision."

“Is there not a bird called an oyster-catcher,” Jack asked. “I wonder if it tries to get at the inside of those shell-fish, and whether it ever shares the same fate as the rail.” The oyster-catcher, or sea-pie as it is better called, is a pretty common bird all over our coasts; it is black and white, can run, swim, and dive well, and has a beak about three inches long, of a bright deep orange at its base, lighter in colour towards the tip. The bird is sometimes exposed for sale in the Liverpool market. Mr. Gould thinks that the oyster-catcher has been falsely accused of destroying the much-esteemed oyster, though he may detach limpets from the rock, and no doubt destroys other small molluscs, worms and other marine creatures. Mr. Yarrell says that young birds are frequently kept tame, and will associate with domestic poultry. Mr. Wiseman has seen a carrion crow come at low tide, pick up an oyster, and flying up in the air, let it fall against the ground, and then descending, get the meat out of the shell as best he could.


“What are young oysters like, papa,” said Willy, “and what makes them so scarce and dear, as they have been for some years past?” The young oysters when they leave their mother’s mantle are very unlike their parents; they are provided with a swimming apparatus, formed by a kind of ciliated pad, the numerous hairs of which, by their constant motion, row the little creatures about in search for food and a resting place. How long this locomotive life lasts I do not know; but the young ones in time settle down on old shells and other submerged bodies as

“spat,” taking the form of the adult shell, and growing for about four years, when they first become ready for the market. I cannot answer your question as to the scarcity of oysters; it seems an essential condition that the spawning time should be favoured with calm and warm weather, and this rarely occurs at the critical time. Perhaps, in a few years’ time, experiments may be tried in the large new aquarium at Brighton, and the present perplexing problem be solved.

“What is that pretty shell-fish crawling over this large stone?” asked May. It is one of the top shells (*Trochus ziziphinus*) and a large and very handsome species. It has a sharp rasping tongue, which under the microscope is a beautiful object. The different kinds of “tops” are useful in an aquarium; for by means of their rasping tongues they mow off the green confervoid growth that under the influence of light soon obscures the glass. The tide is coming rapidly in now, so we will go to our lodgings.

All hail to the rivers, the rocks, and the shores !
Thou wide-rolling ocean, all hail !
Now brilliant with sunbeams and dimpled with oars,
Now dark with the fresh-blowing gale,
While, soft o’er thy bosom the cloud-shadows sail,
And the silver-winged sea fowl on high,
Like meteors bespangle the sky,
Or dive in the gulf, or triumphantly ride,
Like foam on the surges, the swans of the tide.

WALK XI.

HAT a storm there is this morning! the wind is blowing almost a hurricane; the mighty waves, curling in sheets of foam, tossing themselves on high, and fighting furiously with each other, roll heavily upon the shore. The sea-gulls are wheeling to and fro, and uttering their wild shrieks, no doubt wondering what the wild waves are saying. See how the water dashes with tremendous fury against that jetting rocky prominence in the distance.

And it bubbles and seethes, and it hisses and roars,
As when fire is with water commix'd and contending;
And the spray of its wrath to the welkin up-soars,
And flood upon flood hurries on, never ending;
And, as with the swell of the far thunder boom,
Rushes roaringly forth from the heart of the gloom.

The most magnificent storm I ever witnessed was when your mother and I were staying at Herm, one of the Channel Islands, many years ago; it was the time of the equinoctial gales, and lasted for some days, with more or less intermission. Let us go on the beach; the strong blustering wind will give us an appetite.

Blow winds, and crack your cheeks,

you cannot hurt us, and I dare say you will bring some zoological treasures to the shore! Ha! what do I see rolling over and over in the water in the distance, showing their dark bodies in the white foaming waves for a second or two, and then disappearing? "I know," said Willy; "they are porpoises. There! one jumped quite out of the water. Porpoises are not fish, are they, papa, any more than whales are? They do not breathe by means of gills in the water, but come to the surface, and there take in a supply of atmospheric air." Quite right; though of a fish-like form, porpoises, as well as whales, are not fish at all, but mammals; that is, as you know, animals that suckle their young. Porpoises have warm blood; fish are cold-blooded animals. A few years ago there was a live porpoise in the Zoological Gardens, Regent's Park, London, and a very interesting sight it was to see it swim round its tank; every now and then, exposing its nostril, or "blow hole," which is right at the top of the head, to the air, then descending into the water; as the head sunk the dorsal fin appeared and then disappeared, leaving the impression that the porpoise really rolled over. You remember the porpoise Mr. Bowring, of Wellington, gave me about two years ago; what a thick coat of fat or blubber it had. "This wrapper or blanket, as it has been appropriately called, being a bad conductor of caloric, will at once resist the surrounding cold, and retain the animal heat." It serves also to buoy the animal up, as it is specifically lighter than the water in which the animal swims. I buried this

porpoise in the garden, after having cut off all the flesh I could. We will dig him up some day, and set up his skeleton.

"Oh, papa," said May, "what is this odd-looking tough leathery bag attached by one end to this scallop shell?" It is one of the Ascidians, or tunicated molluscs; see, I press it, and the water spurts out from the two holes at the top. As they are covered by a leathery skin, they have been called *Ascidians*, from *askos*, a Greek word, meaning a "skin," or "wine-bag." I have often dredged them up in great abundance; their structure and history are full of the deepest interest. They are usually attached to rocks, shells, or sea-weeds; others, however, float in the sea. There is great variety amongst them, and some are extremely beautiful in colour. They feed on *desmidiæ*, *diatomaceæ* and the spores of other algæ, which are brought to the mouth, which, oddly enough, is not situated at the top, but at the bottom of a bag enclosed in the interior of the creature, by means of an infinite number of vibratile cilia that clothe the respiratory chamber: these bring currents containing minute particles to the creature's mouth. The two holes at the top will remind you of the siphons of some of the molluscs, whose functions I described in one of our walks. The water enters at the one hole, which we may call the "inhalent orifice," and is expelled at the other, the "efferent orifice." I shall never forget my delight at finding in Guernsey, some years ago, several groups of the crystalline *Olavelina lepadiformis*. From the exceeding transparency

of the tunic, it was easy to make out the whole of the pretty little animal's anatomy. "What are the young Ascidians like?" asked Jack. "Do these creatures undergo a metamorphosis?" Yes; when the young is first hatched it bears a strong resemblance to a tadpole; the body is oval, furnished with black eyespecs, short tentacles, and a long tail, by means of which it swims. In time the tail is absorbed, and the larva assumes the form of the parent.

"Oh! what an extraordinary thing I have found," said Jack; "it is entangled in a mass of sea-weed, and looks like sea-grapes. What a funny idea! Fancy grapes growing in the sea." What you have found are the eggs of a cuttle-fish (*Sepia*), and as you say they are very like grapes, only more pointed at the top; the stalk ends are attached or coiled round part of the stem of *Laminaria*. You see these eggs are soft to the touch, but have a tough skin somewhat resembling indian-rubber. When the young cuttle-fish is ready, the egg case is rent asunder, and Master Cuttle enters on his career. The adult cuttle is about a foot in length, oblong in form, and of a dirty white colour, but spotted all over with a number of coloured marks which dilate and contract, and are perpetually changing their form and position; these changes being produced with great rapidity. I have witnessed this curious phenomenon on three or four occasions; even after death the spots continue to play. Around the cuttle's mouth there are arranged eight short thick arms, each one furnished with a double row of suckers; besides these there are two more arms, much longer

than the rest, and dependent; they are slender except at their ends, which are dilated and which alone are furnished with suckers. Along the whole of the creature's body runs a side fin, or flattened membrane; it is supposed that by these fins the creatures can throw themselves out of the water, and shoot along in the air for some distance; whence they are termed Flying Squid. "During a calm," says Mr. F. D. Bennet, "in lat. 30° N., the flying squid appeared in larger flights than we had ever before witnessed, persecuted probably by the albacore (which select the tranquil time to descend deep in the water, and to rove far from the ship in quest of food), they rise from the sea in large flocks, leaping over its smooth surface, much in the same manner and to the same height and distance as the flying fish. Many of them were captured by birds during their leaps, and one individual in making a desperate effort to escape some aquatic pursuer, sprang to a considerable height above the bulwarks of the ship, and fell with violence upon the deck." "Is the substance called *Sepia*, which artists use in their drawings, taken from the cuttle-fish?" Willy asked. It is, or I should rather say it was; for I believe a considerable portion of *Sepia* is now produced from other sources. Inside of the cuttle-fish is a small pear-shaped sac, which contains a dark brown fluid; there is a channel or duct leading to the efferent or exhalent syphon through which this inky fluid can be forcibly expelled. "What is the use to the animal of this fluid?" said Jack. It serves it as a means of escape, for when pursued it squirts out this dark fluid,

which colours the water and prevents its enemy seeing it. This curious fact was known to the ancient Greeks and Romans, several of whom allude to it. They used it also as ink, as the following lines from Persius will show—

Tunc queritur, crassus calamo quod pendeat humor ;
Nigra quod infusa vanescat sepia lympa ;
Dilutas queritur gemit quod fistula guttas.

“Then he complains that the ink, become thick, sticks in his pen ; then, that if water be added, the black sepia vanishes altogether, then that the reed makes blots with the diluted drops.” The following anecdote of the way in which the cuttle-fish can behave will amuse you. One day “a gallant officer who was inconsiderately collecting shells in a pair of immaculate white trousers, came suddenly upon one of the naked Cephalopoda snugly harboured in a recess in the rock. They looked at each other, and the cuttle, who had his eyes about him, and knew well how to use them upon seeing the enemy advance, took good aim, and shot so true that he covered the snowy inexpressibles with the contents of his ink-bag, and rendered them unpresentable either in drawing-room or dining-room.” The creatures possess exceedingly strong parrot-like beaks, capable of inflicting severe wounds. There are many stories of gigantic cuttle-fish attacking men and even ships, but these stories are purely fictitious. How the wind blows the sand along the shore ! Now Jack and Willy you may run a race with it. There goes May’s hat off, so now you have something to run

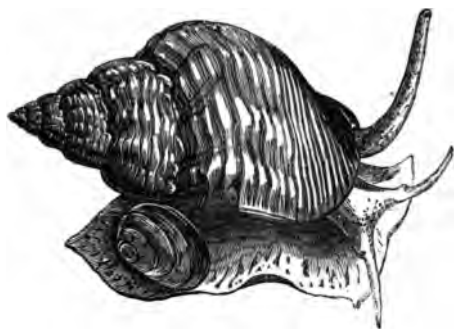
for. Well done, Willy, you have caught it just before it reached the water.

“What is this long sword-shaped shell,” asked May, “lying on the sand?” It is the shell of the *Solenensis*, or razor-fish, as it is sometimes called; it is now empty; the animals that inhabit these shells burrow in the sand, but can also dart about in the water by a rapid opening and shutting of the valves. I believe they are very good to eat, but I have never tasted them. “On the retreat of spring-tides they may be seen nearly half out of their holes, apparently taking in a supply of oxygen for their gills. They are evidently sensible of vibratory movements in the air, as well as on the ground, taking alarm at greater or less distances, according to the state of the atmosphere and direction of the wind. When the solen is disturbed it squirts out water in a strong jet, and having thus compressed the volume of its body, it lengthens and darts out its dibble-shaped foot, and rapidly disappears below the surface to a depth of two or three feet. A solen hunt requires considerable alertness, for if you cannot approach near enough to catch them when partly exposed to view—and this is not easy, their muscular strength being, in proportion to their size, far greater than that of a man—and you delve with your hands after them, they will probably beat you in the race.” You have often laughed at being told to catch a bird, Jacko, by putting a bit of salt on its tail! Well, oddly enough, razor-fish are caught by salt. Fishermen put a pinch of salt in their holes, and out pop the razor-fish. “What effect,” asked

Willy, "has the salt upon them?" Some of the fishermen think that the razor-fish believes the tide is coming in, and rises up to inhale the water. It is probable that the angular particles of salt irritate the creatures by pricking the delicate mantle; so they come to the surface to eject the salt. The mode of catching solen-fish at Naples is very curious. Poli tells us "that the lurking-place of the solen is betrayed by a hole in the sand, agreeing in shape with the apertures of its tubes or siphons. When the water is shallow the fisherman sprinkles some oil on the surface, in order to see these marks more clearly. He then steadies himself by leaning on a staff with his left hand, and feels for the solen with his naked right foot. This he catches, and holds between his big toe and the next; but although his toes are protected by linen bands, the struggles of the solen to escape are so violent, and the edges of the shell so sharp, that very often a severe wound is inflicted by it. When the sea is five or six feet deep, another mode of fishing is adopted. It consists in the fisherman diving or swimming under water with his eyes open, and after having found the holes, digging with his hands for the razor-fish. Sometimes the solen so forcibly resists being taken, that it will suffer its own foot to be torn away, or will even die, rather than surrender."* In places where the razor-fish is sought after for food by poor fishermen and others, it is caught by means of a long narrow wire, bent and sharpened at one end; this is suddenly thrust into the hollows of the sands,

* "British Conchology," vol. iii. p. 13.

which mark the animal's presence, and transfixes its flesh between the valves. Here is another whelk, and this time the creature is at home ; the storm of last night has washed him up on shore from deep water ; we will put him on this stone, perhaps he will begin to crawl away. There, you see his two horns and large flat thick body.



Here is *Tellina solidula*, with the animal inside ; I will put it in this bottle of water, with a little sprinkling of sand at the bottom. Now, you see the two long siphons, through one of which the water is taken in for respiration, and expelled through the other. Here, too, is *Donax anatinus*, with its living inhabitant. Here is an old oyster-shell, riddled through and through with small holes. " Meeting with such worm-eaten shells, many persons will pass them by without paying the slightest attention, or, at most, will honour them with but a heedless glance. Others may confine their reveries to recollections of oyster suppers ; but it

is just in proportion as our knowledge of natural history extends, and a taste for it exists in the mind, that such an object is capable of interesting us ; simple and



TELLINA SOLIDULA.

common as it appears, a long chapter might be written in merely recording the history of its inhabitant from the time when it lay quietly on its bed among other oysters, lodged in its firmly-built house, and appearing to defy all intruders, to the present dismantled state of the shell, resembling a ruined fortress, pierced in



DONAX ANATINUS.

all directions with cannon shot. The number of enemies which the oyster meets with is considerable, not to speak of those who attack him in front ; and no doubt the dilapidated example before us is the work of several sets of teeth. His first assailants were probably small sea-worms, which, boring through the

shell, attacked him at all points. At first he resisted their assault by fresh depositions of pearly matter, interposed between his soft parts and their intruding mouths, and thus pearls were cast in the path of the enemy. But, alas! they were offered to a swinish multitude, who turned aside to renew the attack on an unprotected point, till the poor oyster's strength was well-nigh exhausted in the struggle. Then in the holes pierced by the worms a parasitic sponge (*Hali-condria celata*) probably established itself, which ate further into his vitals, causing the softer parts of the shell to rot away, and spreading through its whole substance, like the dry-rot fungus through a solid beam of timber, until, under his accumulated misfortunes, the poor oyster perished, and his loosened shell was cast to the mercy of the waves."*

Ah! what is that small bird flying somewhat wildly about? I do believe it is the storm petrel, which the gale last night has brought to the coast. The petrel is the smallest web-footed bird known; specimens are frequently driven to great distances inland by the strong wind; they have been taken in Birmingham, Coventry, and near Newbury, in Berkshire. Petrels are chiefly birds of the ocean, and seldom voluntarily approach land, except during the breeding season. They lay one small white egg. They are supposed to be seen only before stormy weather, and are therefore unwelcome visitors to superstitious sailors, who call them "Mother Carey's chickens," Mother Carey being, I suppose, some witch or hag of that name. From its

* Harvey's "Sea-side Book," p. 60.

habit of paddling along the surface of the water, it received the name of petrel from the Apostle Peter, who, you may remember, walked on the water.

Mr. Yarrell says it roves over the great part of the Atlantic, feeding on small fishes, crustacea, and mollusca to be found about the extensive masses of seaweed which float about the surface of the ocean. The bird will keep in company with a ship for many days, sometimes for shelter, but also for the sake of the various matters thrown overboard, as they are always ready to stoop and pick up bits of biscuit or meat. On examining the stomach of a stormy petrel, Mr. Couch found about half-an-inch of a common tallow-candle, of a size so disproportionate to the bill and throat of the bird, that it seemed wonderful how it could have been able to swallow it. Other species of petrels occasionally visit our coasts.

Here is a very pretty sponge; it is composed of many branches, each about the size of a goose-quill; of a light sandy colour; it is very common, but very interesting. It is now merely a horny skeleton; but when it was attached to the rock it was full of a living jelly-like substance, which constituted the animal. This species (*Halichondria oculata*) is often found amongst the shore refuse, having been washed up by the tide. When the creature is alive, to quote the words of the late lamented Dr. Harvey, every portion of the horny fibre is coated over with a semi-fluid slimy matter, like a half-consistent jelly, seeming inert and unorganized, and yet the seat of whatever life the sponge contains. It is by this slime, which may be pressed

out with the finger, that the network is deposited, and from it the whole growth of the mass proceeds. The slimy substance is apparently void of sensation, for it does not shrink when wounded; and the only motion resembling animal life which the mature sponge exhibits is in the imbibition and expulsion of continuous currents of water. If any species of sponge be examined—look at this piece I hold in my hands—the holes with which the substance is everywhere pierced may be seen to be of two kinds, one of larger size than the rest, few in number, and opening into wide channels or tunnels which pierce the sponge through its centre; the other minute, extremely numerous, covering the whole surface, and communicating with the innumerable branching passages which make up the body of the skeleton. According to the observations of Dr. Grant, water is freely imbibed through the smaller holes, and continuously expelled in jets through the larger as long as the animal retains life. These currents may be seen, if a small specimen of a living sponge be placed in a watch-glass or other shallow vessel of salt-water, and examined through the microscope. Nourishing particles dispersed through the water are received into the universal stomach, and what is not required is ejected through the canals.


“Where,” asked Willy, “do the sponges which we use to wash with come from? Are there any British species that would do for that purpose?” No, I believe, not a single one. The sponges of commerce are obtained chiefly from the Mediterranean; Smyrna,

I believe, is the great market for them. There are three distinct kinds of sponge: the horny kind (*Cornea*), which are destitute of spicules, to this belongs the sponge of commerce; the silicious kind (*Silicia*), which have imbedded in their substance a great quantity of flinty spicules; and the calcareous kinds (*Calcareae*), of a somewhat gristly substance, containing many calcareous spicules. These spicules not only vary in composition, but in form; when examined under the microscope many are very beautiful objects.

Sponges can increase by division; they also are propagated by what are termed gemmules, which sprout from the delicate gelatinous substance which covers the skeleton; these are of an oval form, covered with cilia, a word with which, by this time, you must all be familiar. For some time the young sponge swims freely about, rowing itself along by means of cilia, just as a ciliated animalcule; by and by it becomes fixed to some object, and gradually assumes the form of a sponge. I will show you both these gemmules and many forms of spicula when we return to Preston. We will now return to our lodgings.



WALK XII.

HAT a contrast is this day to that on which, four days ago, we had our last walk together. The surface of the sea is undisturbed by the slightest breeze; it is as smooth as glass, and looks so calm and placid, one can scarcely conceive how angry and foaming it was a few days ago. Well, the sea in every condition is, to me, always the source of wonder and delight. When it is stormy, we may expect some interesting zoological specimens to be cast up by the waves; when it is calm, we may expect, amongst other things, to see some of the medusæ swimming joyously in the water. Besides, you know when bathing, the rough waves are not over pleasant, but when it is calm, then you can have a good swim. "Yes, papa," said Willy, "but are you not more likely to get stung by one of your favourite medusæ when the water is calm? You know the other morning, when you and Jack and I bathed before breakfast, you got stung on your arm by a jelly-fish, and the water then was unruffled. Did the stinging hurt you much?" The sensation was exactly like the sting of a nettle, only it was much more intense; it produced a redness on the part where I was

stung, which was under the arm, but I did not feel much pain in two hours afterwards. "But how do these jelly-fish sting?" said Jack; "they have no pointed weapons like bees and wasps, have they?" The stinging power which, however, is probably possessed by a few species only, is supposed to reside in small capsules placed on the medusæ's skin; within these capsules a spiral thread is seen. "The *Cyanea capillata* of our seas is a most formidable creature, and the terror of tender-skinned bathers. With its broad tawny, festooned and scalloped disc, often a full foot or more across, it flaps its way through the yielding waters, and drags after it a long train of ribband-like arms, and seemingly interminable tails, marking its course when the body is far away from us. Once tangled in its trailing 'hair,' the unfortunate who has recklessly ventured across the graceful monster's path, too soon writhes in prickling torture. Every struggle but binds the poisonous threads more firmly round his body, and then there is no escape; for when the winder of the fatal net finds his course impeded by the terrified human victim wrestling in its coils, he, seeking no combat with the mighty biped, casts loose his envenomed arms and swims away. The amputated weapons, severed from their parent body, vent vengeance on the cause of their destruction, and sting as fiercely, as if their original proprietor itself gave the word of attack."

The young of the medusæ are very unlike the parent form, and were once considered to be adult creatures, allied to the hydræ of our fresh-water

ponds, on account of their strong resemblance to them. The name given to this little creature was *Hydra tuba*. When the young medusa first appears, it has an oval form, and is surrounded with cilia. In course of time it attaches itself to some object, puts out four arms or tentacles, which, by and by, are succeeded by many more; at this time buds or germs frequently grow from its side, just as you remember occurs in the hydræ of our fresh-water ponds; the



body of the creature then lengthens, and at last becomes wrinkled; these wrinkles, by and by, become deeper and develop tentacles at their edges; and



in time each ring detaches itself, and swims away an independent creature. Ultimately, these hydra-like larvæ assume the adult form of medusæ. Ah!



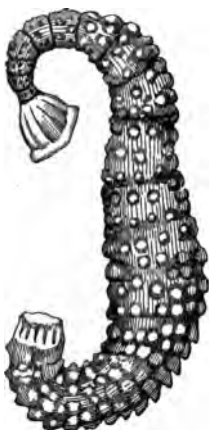


I have found a treasure now in the water close to the shore ; it is as transparent as glass, and looks like a large dew drop when illumined by the sun's rays. If I am not mistaken, it is the lovely and delicate little medusa called *Cydidippe pomiformis*. Fill my bottle with clear sea water, May. There, now, I put my little globule of ice—it is about the size of a pea—into the bottle, and see at the lower end are two long thread-like processes ; these can be folded up and enclosed in the interior of the little creature's body ; but what the use of these graceful appendages is, remains unknown. But the most beautiful part about it is its machinery for moving from place to place. "Stretching from pole to pole of this translucent little orb, like lines of longitude upon a globe," as Professor R. Jones has well said, "and placed at equal distances, are eight broad bands of more consistence than the other portions of the body. On these bands are placed thirty or forty paddles, broad flat plates, for such they seem when magnified, with which the little creature rows itself along. But here the difference lies between the art of man and nature. Man to move his wheels must have much cumbersome machinery ; the furnace, and the boiler, and the herculean arm that makes the wheel revolve, but here all these may be dispensed with, for the paddles are themselves alive, and move themselves at will, with such degree of force as may be needed, either at once, or singly, or in groups, working with mutual consent in any way required."

Here are a few sea anemones, the common smooth

species ; but this shore, as I said, does not present us with much variety. I hope we shall some day be able to spend our sea-side holiday at Tenby or Weymouth, when we should meet with a great many beautiful kinds of sea-anemones. The Menai Straits, however, are not bad hunting ground ; we must bear them in mind if the tide suits for a visit there.

“What is this leech-like thing,” said Willy,

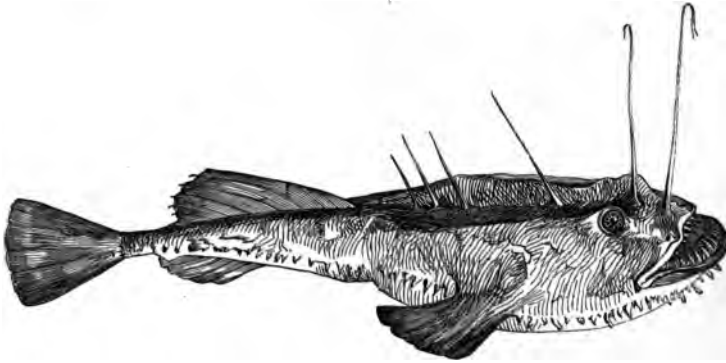


SKATE-LEECH.

“lying on the shore ? It is alive.” It is the skate-leech, *Pontobdella muricata*, frequently parasitic on the skate. By means of its sucker it can attach itself securely to the skate, whose blood it sucks. It lays egg-capsules, which something resemble those of the dog-whelk.

“Here are the jaws of some kind of fish,” said

Jack, "that have been washed ashore, perhaps, by the storm the other day." They are the jaws of a very curious fish, called the Angler, or Fishing-frog (*Lophius piscatorius*), a very voracious fish indeed, with an enormous head and wide mouth. It is not a very active swimmer, so has recourse to stratagem to take its prey. On the top of the head are two long slender appendages, which are formed of bone and



THE ANGLER.

covered by the skin; they are curiously fastened or articulated at the base with the top of the head; the process nearest the mouth is articulated by a ring with another ring in the skull, so that it can be moved about in any direction. Now, these long processes are Mr. Angler's fishing-lines, and the use he makes of them is most interesting. The angler hides itself in the sand or mud at the bottom of the water; it then raises these lines, and moves them about most attractively in various directions. Other fish, looking

upon them as tempting bait, are allured to the spot with the intention of making a meal of them, when all of a sudden up springs Mr. Angler, and seizes the unfortunate deluded victim, whom he rapidly devours. There is a beautiful specimen of the skeleton of the angler-fish in Brown's Museum at Liverpool. When we next go there, we must not forget to notice the mode of articulation of this fish's bait-line with the skull, which is beautifully shown.

Bring me a couple of those limpets, Jack, that rest on that stone; I will show you what curious rasp-like tongues these molluscs possess. "All very well, papa, but he sticks so fast to the stone I cannot move him, though I thought at first, before I touched him, I could easily pick him up." Yes, the muscles of the limpet's foot are enormously strong, and enable him to hold the stone most firmly.

At distance view'd it seems to lie
On its rough bed so carelessly,
That 'twould an infant's hand obey,
Stretch'd forth to seize it in its play;
But let that infant's hand draw near,
It shrinks with quick instinctive fear,
And clings as close as though the stone
It rests upon and it were one.

And should the strongest arm endeavour
The limpet from the rock to sever,
'Tis seen its loved support to clasp
With such tenacity of grasp,
We wonder that such strength should dwell
In such a small and simple shell.

"Have you ever eaten limpets?" Willy asked. No, I never ventured on any; I should fancy they must

be very tough. The primitive inhabitants of North Britain must have consumed great numbers of them, for heaps of their shells are constantly being turned up. Mr. Gwyn Jeffreys says "roasted limpets are capital eating." "A few years ago," he adds, "I was a guest at a dinner-party in the little island of Herm. The hour was unfashionable—one o'clock, and the meal was served on the turf in the open air. This consisted of fine limpets, laid in their usual position, and cooked by being covered with a heap of straw, which had been set on fire about twenty minutes before dinner. There was also bread and butter. The company were a farmer, two labourers, a sheep-dog, the late Dr. Lukis, and myself. We squatted round the smouldering heap, and left on the board a couple of hundred empty shells." In some places limpets are collected for feeding pigs; in Ireland and the north of England the poor people consume great numbers; they are also extensively used as bait by line fishermen.

"Oh, papa!" said Willy, "do look here; as I was grubbing amongst these stones I fished out this crab, whose back is covered with oysters." It is not uncommon to find oysters and mussels parasitic on crabs and other crustacea. Some of these oysters, I should say, are three or four years old; as *spat* they dropped upon the crab's shell, and there have grown. The crab has small thin claws, and is no doubt a sickly individual, having suffered from the presence of the oysters. You remember my telling you that crabs cast their shells every year, but this individual has

evidently not cast his coat for some years. Talking of oyster-spat reminds me of a mode of artificially rearing oysters, at one time much practised in France ;



fascines or bundles of faggots are formed, and sunk by stones ; when the young oysters are ready to



„ settle down ” in life, they attach themselves to these faggots, and when they are large enough for the market they are removed ; but I believe fascines are

not much used now, having been superseded by tiles of various shapes.

Here are a few periwinkles crawling on this fucus ; let us take a few to our lodgings for examination. The periwinkle is a valuable addition to the marine aquarium, for, by means of a long rough tongue, it mows off the green confervoid growth which, under the influence of light, would soon obscure the glass. "Are not these the creatures which I have seen people eat?" said Jack. Yes, periwinkles are extensively used as food amongst the poor of the sea-port towns, and you may often see old women picking them out with pins, and eating them with great gusto. "The supply is about two thousand bushels per week for six months, from March until August inclusive, and about five hundred bushels per week for the remaining six months. The number of persons employed in gathering is at least one thousand (chiefly women and children), and quite as many more in selling. The best gathering grounds are the coasts of Scotland, Orkney, Shetland, and Iceland. The trade price varies from two to eight shillings per bushel of eight gallons heaped measure ; the larger the 'winkles' are the higher the price. Those gathered from rocks keep a fortnight in summer and a month in winter ; mud winkles will not live more than half that time."*

Careful examination of sea-weeds will often reveal most beautiful forms of molluscan life. Tennyson has some very pretty lines on a delicate shell, which you may learn by heart :—

* "British Conchology," iii. 375.

See what a lovely shell,
Small and pure as a pearl,
Lying close to my foot,
Frail, but a work divine,
Made so fairly well
With delicate spire and whorl,
How exquisitely minute,
A miracle of design !

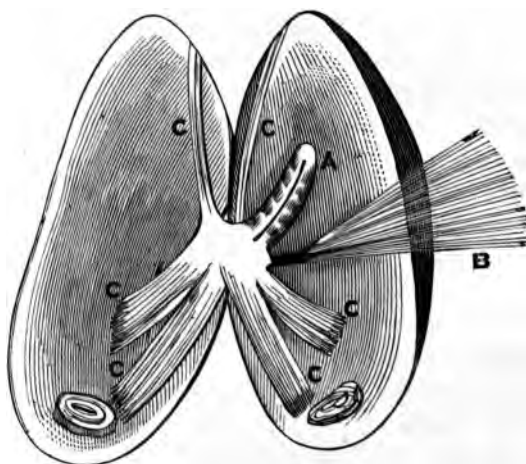
What is it ? A learned man
Could give it a clumsy name.
Let him name it who can,
The beauty would be the same.

The tiny cell is forlorn,
Void of the little living will
That made it stir on the shore.
Did he stand at the diamond door
Of his house in a rainbow frill ?
Did he push, when he was uncured,
A golden foot or a fairy horn
Through his dim water-world ?

Slight, to be crush'd with a tap
Of my finger-nail on the sand,
Small, but a work divine,
Frail, but of force to withstand,
Year upon year, the shock
Of cataract seas that snap
The three-decker's oaken spine
Athwart the ledges of rock
Here on the Breton strand !

Here is a small mussel-bed ; see how firmly fixed the molluscs are one to the' other, each secured by a substance called *byssus*. I will open this specimen ; the fleshy tongue-shaped organ is the creature's foot, by means of which he fastens the byssal threads to

any object. The byssus is probably formed by a secretion in the foot; at first it is a mere speck of white transparent matter, which spreads out and immediately hardens like china-cement. This plate serves as a place of attachment, and from the centre of it the mussel secretes very slowly, and by a backward movement, a gluey thread, repeating this process



MUSSEL OPENED, SHOWING FOOT (A), MUSCLES (C), AND BYSSUS
THREADS (B).

ten or twelve times in a circular direction. The threads become horn colour in about twenty-four to thirty hours after being spun.”* Byssus threads vary much in appearance and texture, “being sometimes black as in the mussel, sometimes of a golden-

* “British Conchology,” ii. 107. See also “Intellectual Observer,” ix p. 53.

brown as in the pinna, sometimes hard and stiff, and sometimes soft and silky."

Mussels have from time immemorial been a favourite article of food, but as at some seasons they are very unwholesome, many cases of serious illness and even of death having occurred from eating them. "The 'faculty,'" Mr. Gwyn Jeffreys observes, "seem to be completely at fault as to the nature of this poison. By some it is attributed to the mussels living among putrescent matters, as in docks and near the outlet of public sewers; by others to their feeding on the spawn of star-fish, which are well known to be poisonous; by others to their being too freely eaten, and causing a surfeit, or to a morbid state of the system in the persons eating them; by a few to their imbibing into their tissues a solution of copper; and Delle Chiaje showed that in many instances it was owing to these mollusks being at the time in spawn, and therefore out of season. A strange notion once prevailed that the poor little pea-crab was the author of all this mischief."

Some years ago mussels were gathered and spread over the fields in Lancashire as manure. One writer tells us that the shell serves as a razor to shave with! I can say with Mr. Gwyn Jeffreys, "I should not like to try the experiment on a frosty morning, or when late for breakfast." It is stated that "mussels are used at Bideford to fix, by means of their byssus, the stones of a bridge, which is difficult to keep in repair owing to the rapidity of the tide. The interstices of the bridge are filled with them, and it is said that

only their strong threads support the fabric, and prevent its being carried away."

"Oh, papa, do look at this extraordinary-looking creature," said May, "I do not like to touch it." It is a mollusc popularly termed a sea-hare (*Aplysia*). What queer creatures they are! As Mr. G. H. Lewes amusingly says in his charming "*Sea-side Studies*," "One would fancy them slugs which had been troubled with absurd caprices of metamorphoses, and having first thought of passing from the form of slugs to that of hares, changed their weak minds and resolved on being camels: but no sooner was the hump complete than they bethought them that, after all, the highest thing in life was to be a slug, and so as slugs they finished their development." Do you see, as I handle this specimen, what a quantity of purple fluid it throws out? Though perfectly harmless, the sea-hare has for ages been considered a very poisonous animal. The tongue or palate of the sea-hare is an extremely beautiful microscopic object. I will show you one when we get home again.

And now our last walk is ended; to-morrow we return to Preston; the refreshing sea-air has put strength into our limbs and pure blood into our veins. I hope you will all continue to use your eyes in the examination of those countless forms of plants and animals which surround us on all sides, whether in the country or at the sea-side. It has been well said that "mere amusement will naturally lead us into the solemn temples of philosophy," for the naturalist may be anything, everything. "He may yield to the charm

of simple observation ; he may study the habits and habitats of animals, and moralise on their ways ; he may use them as starting points of laborious research ; he may carry his newly-observed facts into the highest region of speculation ; and whether roaming amid the lovely nooks of nature in quest of varied specimens, or fleeting the quiet hour in observation of his pets—whether he make natural history an amusement, or both amusement and serious work—it will always offer him exquisite delight.” We will take one more look at the sea.

Beautiful, sublime, and glorious ;
Mild, majestic, foaming free ;—
Over time itself victorious,
Image of eternity.

Such art thou, stupendous ocean !
But, if overwhelmed by thee,
Can we think without emotion
What must thy Creator be ?



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